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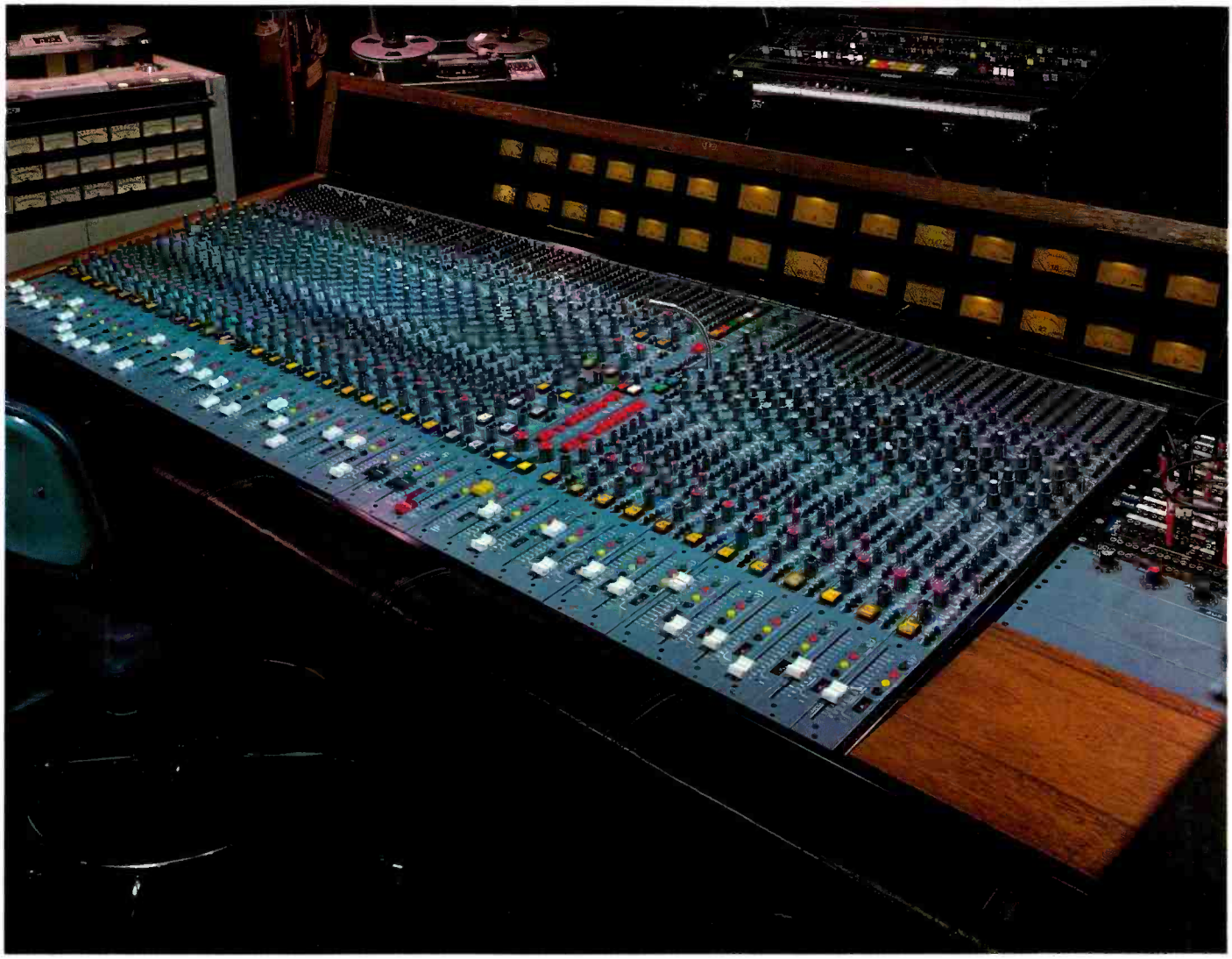

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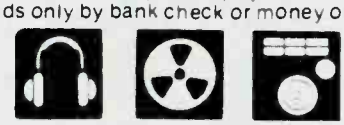

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Studio D film and video scoring stage at record plant, Los Angeles. The console is a 48-input E-Series automated desk from **Solid State Logic**, in a **Sierra/Eastlake**-designed room equipped with **Sierra Audio** SM3 monitors. The room is capable of accommodating simultaneous 46-channel analog, as well as **3M Digital** 32-track sessions. Photography by **Kathy Cotter**.

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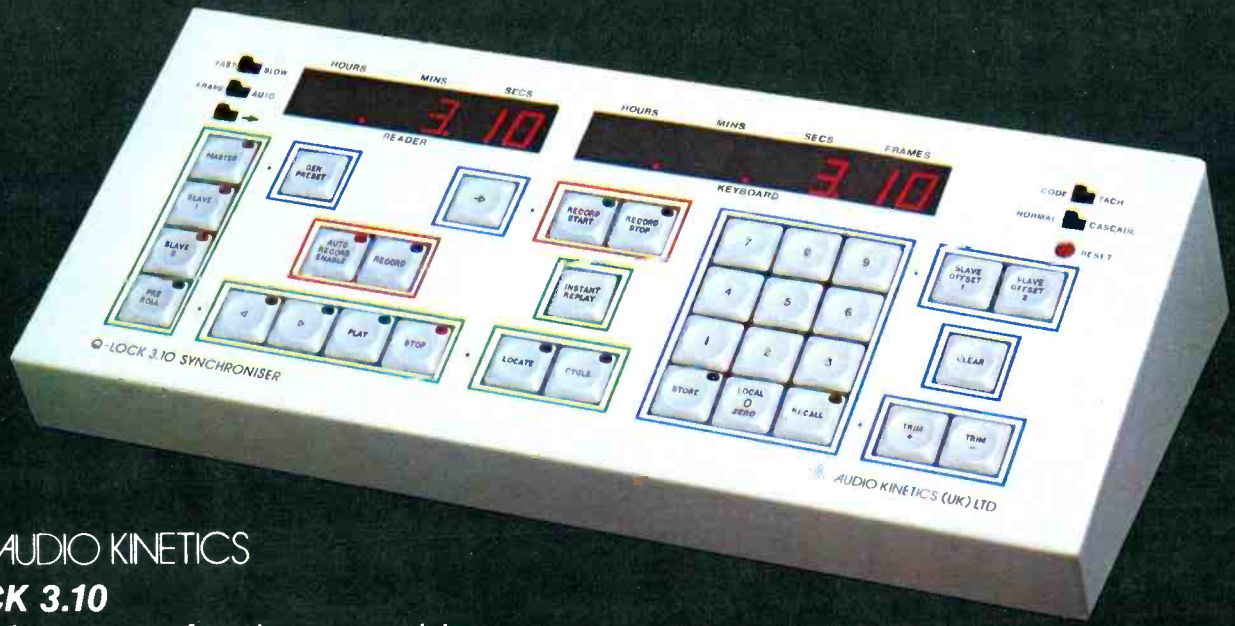

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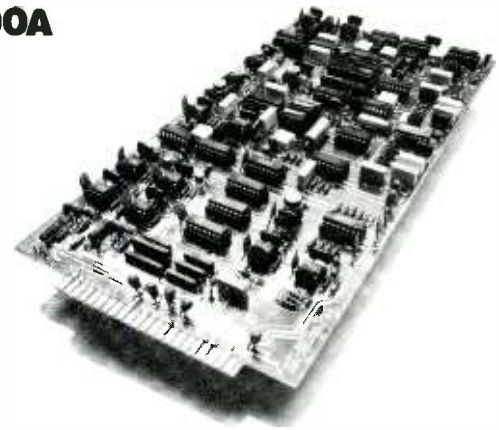

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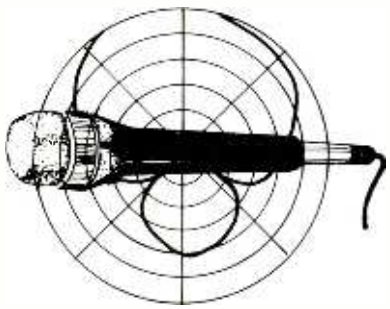

MICROPHONE POLARITY AND A-B POWERING WITH XLR-3 CONNECTORS

from: **Michael Strong**
Society of Motion Picture & Television Engineers
Chairman, Committee on Audio Recording and Reproduction Technology
Scarsdale, NY

In the motion picture and television industries a serious standardization problem has arisen regarding the polarity of microphones, which has now finally been resolved with the efforts of a sub-committee of the SMPTE Recording and Reproduction Technology Committee.

The difficulty originated some time ago with the use of transistorized condenser-microphone power supplies. There has been an assortment of powering in the past, with the microphone power supply being fed on separate conductors within the cable. Then came the "phantom" supply, which uses the ground shield as one power supply conductor, followed by the A-B, or "T" powering, which actually uses the two audio conductors for the power supply.

The whole history of phantom powering is quite complex due to the fact that it has evolved over the years and, as a result, standardization has had a rocky path. Even today there are two voltages in use — 18 V and 12 V. In earlier portable recording equipment 12 V became popular, since the internal power supply of the equipment was used for the phantom supply.

For both location and studio recording, the motion picture industry adopted a portable tape recorder made by Kudelski in Switzerland. The first models were Nagra III, then Nagra IV, and now Nagra 4.2 and IV-S. These machines have become an industry standard, along with Sennheiser condenser microphones. Some studios used small, external-regulated battery power supplies with Sennheiser microphones, while others opt for a special microphone pre-amp with power supply installed by Kudelski in the recorder for convenience.

Unfortunately, the Nagra recorder is designed with a positive ground on its battery power supply, so with the earlier Nagras the phantom supply had negative on the audio conductors and positive on the shield. When A-B powering became popular — due to the phantom powering being noisy if used with long runs of microphone cable — the polarity of the A-B supply was provided with positive on pin 3, and negative on pin 2 of the XLR-3 connector. This, however, is a non-standard use.

Both the phantom and the A-B supplies in Nagra equipment were opposite to that used by music studios which, along with the microphone manufacturers, established the standards. The "phantom" supply should have the shield or pin 1 of the XLR-3 connector as the negative supply, and the two audio conductors — pins 2 and 3 — both positive through resistors. The A-B supply should have pin 2 of the XLR-3 connector as positive, and pin 3 negative; each through a resistor.

The International Standard for microphone phase polarity should not be confused with the polarity of the voltage for condenser-microphone power supplies. This microphone phase polarity, which is also an American National Standard, indicates that an increase in pressure on the diaphragm produces a positive voltage on pin 2 of the XLR-3 connector.

Manufacturers of condenser microphones, including Sennheiser, supply their microphones wired to the XLR-3 connector according to the standards for phase polarity and A-B powering, which in each case requires a positive polarity on pin 2.

When the distributors of Sennheiser microphones found that such a microphone would not work when plugged into a Nagra recorder, they reversed pins 2 and 3 and placed a red dot on the outside of the microphone to indicate a non-standard wiring. This "quick-fix" has created an enormous problem that now involves other microphone and mixer manufacturers — not to mention rental houses.

This is the point at which I hope we will all take a lesson on the necessity for standardization. Such action has caused one of the most frustrating headaches for the audio industry. Some film studios that already had many dynamic and other types of microphones kept to the international standard. Other studios changed all their microphones to have the same phase relationship as red-dotted Sennheiser models. In some areas the reversed pins 2 and 3 became a standard of its own, and even a newcomer in the industry — the Schoeps condenser microphone — was provided with pins 2 and 3 reversed as the normal phasing direct from their factory.

You can imagine the confusion that exists in the rental houses — half of their condenser microphones are connected one way, and the rest another. The ultimate confusion arrived with the television industry having much more activity of location video taping.

Equipment supplies for the TV industry have correctly kept the international standards for microphone phasing and A-B

. . . continued overleaf —

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polarity using the XLR connector. More and more the TV industry has used rental suppliers for microphones for location work. These rental house now have to ask if the microphone is to be used for TV or motion picture sessions, and now some location TV trucks are provided with Nagra recorders, too! In addition, mixer manufacturers are now providing both phase inversion switches and A-B supply reversing switches.

I have been faced with difficulties using a microphone that was connected with pins 2 and 3 reversed on a reading desk in a meeting. When the keynote speaker, who was wearing a lavalier microphone with the correct phasing, got up to speak, his microphone completely cancelled the reading desk mike until I dumped the desk mike. When microphones are used together they should all be phased correctly.

At the last Recording and Reproduction Technology Committee Meeting of the SMPTE, a landmark decision was made to establish that once and for all time both the television and motion picture industries adopt the International Standard for microphone phasing and A-B powering polarity using the XLR connector. Manufacturers have been asked to conform to this practice, as have suppliers of equipment.

The only unresolved issue is concerned with older Nagra recorders equipped with built-in A-B powering. The Committee is suggesting that these build-in supplies should be abandoned, and separate external A-B powering be used instead. Several microphone manufacturers produce small battery units for their mikes, or more recent designs can be purchased from such companies as Audio Services Corporation, or Coherent Communications. However, if only one microphone is to be used, old Nagra recorders can operate via a special, carefully-marked cable with pins 2 and 3 reversed at one end. The build-in A-B powering of newer Nagra recorders can be re-wired in the standard way. Dealers have been asked to provide their equipment wired in this manner.

It will take a while for all non-standard microphones to be weeded out but, with this declaration from the SMPTE, at least new microphones and Nagra recorders will no longer perpetuate non-standardization.

If you have any doubt about your own microphone phase polarity, the standards have this suggestion for determining the correct phasing:

Using a dynamic microphone that does not contain an output transformer, and which allows a visual indication of diaphragm motion, determine the polarity and terminal connections that cause the diaphragm to move inwards. The in-phase terminal is that terminal which results in an inward diaphragm motion when a positive voltage is applied to it. This will be pin #2 of a conventional XLR connector. (A 1.5 V battery can be used safely with a microphone having a 150-ohm or greater impedance.)

I have an old dynamic microphone for which I have established the correct phase. This I use for my reference. The best way of checking phase polarity is to use the polarity tester described in the October 1980 issue of *R-e/p*. This will indicate the polarity of a known microphone, which can then be used to check other mikes, correcting any that are found to be incorrect. Such phase checks can be handled using existing equipment, however.

Align the old reference microphone with the microphone you want to be checked, with their diaphragms side by side. Connect the mikes through a pair of checked cables to a monaural mixer, and listen through headphones. Speak into the old microphone and adjust the gain for normal volume. Now turn up the other microphone gain to the same position on the mixer. If the microphones are in phase, the sound volume will increase. If they are out of phase, however, the volume will decrease to practically nothing. To check an A-B power supply a voltmeter is required.

The standards involved with this problem are:

ANSI/EIA RS-221-A (published in 1971; concerning mike pressure)
IEC 268-4 (1972; mike pressure)
IEC 268-12 (1975; A-B)
DIN 45-595 (1979; A-B)

AN ADDITIONAL STANDARDS "DISK—USSION"

from: **Stephen F. Temmer,**
President
Gotham Audio Corporation
New York, NY

As someone who is vitally interested in standards, under proper safeguards, of course, I would like to try to convince all of those to whom the discussion applies that there is only one way of spelling the word **DISK**. It is derived from the Greek in which the "k" sound is always spelled with a "k". The International Electrotechnical Commission (IEC) has *always* spelled the word **DISK**.

The Journal of the Audio Engineering Society, after years of trying to decide which way to go, finally came down on the side of the correct spelling — again **Disk!** Bell Telephone Laboratories, Western Electric Company, Westrex, and *Billboard* Magazine, are some of the famous names who have *never* spelled that word anything but **Disk**. The Encyclopedia Britannica index under "Disc" has the brief statement: "See Disk".

The entire Computer Industry, from its beginning, has always spelled that word only one way — **Disk**. Disk drive, floppy disk, disk memory, etc., etc. Notable exception is Hewlett-Packard who is in the process of changing over. The IEEE has informed me that the next edition of IEEE Standard Dictionary of Electrical and Electronics Terms (IEEE Standard 100) will change all spellings from "disc" to "disk."

There simply is no English word ending in "sc." Depending on which dictionary you consult, you may find several different listings. Here are some examples:

"British spelling is disc;" "Disk" is preferred;" "Disc refers to the zoological application only; i.e. vertebrates in your back."

The word "disc" has always appeared to me to be the abbreviation for "discount," and

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I feel just as strongly about that strange word "mic" for microphone.

Perhaps this will be successful in urging all who make use of these words "see the light." If anyone would like to have a "diskcussion" with me about this, please feel free to call!

THE TAMPA / ST. PETERSBURG MARKET: FIVE YEARS LATER!

from: **Paul Hayes**
Hayes Recording Studio
Tampa, Florida

I thought I would write to inform *R-e/p* readers of the way that business has progressed since the article, *The Smaller Studio: Tampa/St. Petersburg — A Roundtable*, appeared in the August 1976 issue (Volume 7, Number 4).

So far, two of the three studios represented in the article have survived. The other studio, Professional Broadcast Productions, has gone into audio/visuals almost exclusively. My own studio has been hanging in there, and has just moved up to 24-track.

Although the Tampa/St. Petersburg area is a "major" market, it has been extremely slow in doing anything. Our commercial production has been steadily increasing, but we have been terribly handicapped in the music area with "just" 8-track. Finally, my head engineer, Jim Cottle, and I decided to make the jump, and purchased a Sphere console and Ampex MM-1200 multi-track. I've really been surprised that the area has been overlooked for so long. There has been a lot of talk, but no action until now.

We tried to re-enforce our expected move by adding outrigger equipment over the last year and a half. When we felt that we had added enough to do the job, we moved in the console and recorder. Jim has now finished wiring the console, and installed the Ampex.

So, that's the story of one small studio. We feel that we have done the right thing. At least it is creating a lot of talk and interest. We're supporting the move with local advertising and promotion. Until now the Tampa/St. Petersburg area has been overlooked, and we hope we can correct that.

views

THE EMERGENCE OF THE "MUSICIAN-PRODUCER"
. . . *a view from both sides of the glass*

by Jeff Baxter

The emergence of the musician-producer has been a long time coming. In the good old days, a producer was the guy who owned a record company and/or a recording studio — he was the guy who had the facilities and the bucks. Then came the individual who refined his listening abilities to the point where he could go to work for a record company solely on the basis of his "talented ears." After that we had the house producer who knew how to make records, and was simply employed by a particular record company to do just that. Now the industry has reached a point where we have the A&R producer, who is the person with the ears to discover new talent, and has the knowledge to produce records.

Of course, the engineer-producer has snuck in along the way, as the record company producer became further and further removed from the studio, and more into the corporate scene. As a result, to an increasing degree he relied on his engineer, who got better at production duties by being involved with the decision-making process during a session.

Now it's the turn of the musician-producer who, like engineers, have become competent at producing simply from working in the studio for long enough. Guys like Jay Graydon, Jai Winding, David Foster, Michael Omartean, and myself, who have all been studio rats for years, now have the necessary knowledge. Also, they may be good engineers, because most respectable studio musicians have a good command of their home recording equipment. These days, to be into semi-pro gear means that you're into pro-audio equipment; it's just a question of your level of sophistication. Most musicians have hands-on experience with at least 4- or 8-track sessions, which really is all you require to come to grips with what engineering is all about.

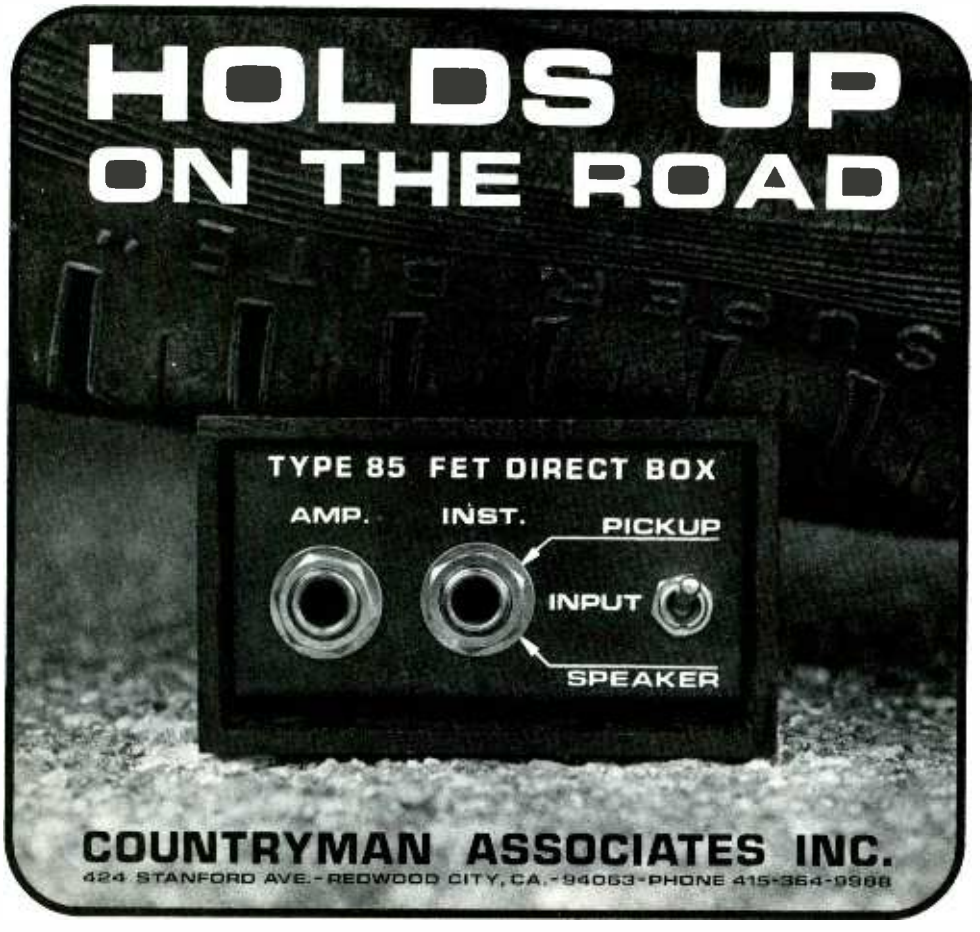
So now we have musicians who have not only written, arranged, sung and played on hit records, but who have possibly produced them as well. From my experience, the trick is to take your knowledge of all the various facets, and fully understand what your level of incompetence is. Having established an overall view of everything that's involved in a session, I know where the extent of my knowledge ends. From that point I *stop*, and assign duties to those who can handle the job better than I can.

For me getting into production was sort of like making love for the first time. If you read enough about it, and see enough guys do it, then you can probably figure out at least something about the technique. Since I started playing in studios at a fairly early age, and would usually get in ahead of time to set up my gear, it didn't take long to understand how a producer puts a session together. Either the producer would set things up for himself, or would know enough about what he wanted to be able to delegate.

. . . *continued overleaf* —

the author —

As a founding member of Steely Dan and one of The Doobie Brothers for three years, guitarist ***Jeff "Skunk" Baxter*** *has also participated in sessions and worked live with Carly Simon, Elton John, Linda Ronstadt, Donna Summer, and Barbra Streisand. Over the past two years he has become increasingly involved with production as well as playing. Jeff has produced albums for The Paul Bliss Band, Livingston Taylor, Nazareth and, most recently, Sneaker. He also played steel and produced Billy & The Beaters in a live recording session held at Los Angeles' Roxy, last February .*



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"The performance and technology sold me. The sound of the '90 sold my clients."

Guy Costa, Vice President and Managing Director, Motown/Hitsville Studios

"When we first got our hands on the Otari MTR-90 we were impressed. The tape handling is superb. The production features are all there. The electronics and logic are to the highest standard we've come across in all the years of Motown's recording history.

But, as I've learned over the past nineteen years in this music recording business, it isn't just specs that count. The producers and artists have to like the way it sounds. A mastering multitrack machine has got to have a "musical" sound. Transparent. Clean. Performance that has to deliver everything possible — right up to the limitations of the tape.

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views

"MUSICIAN-PRODUCER"

Jeff Baxter

Harkening back to my earliest days in a studio, one important thing I realized when I first started producing was that you have to know how to delegate authority. One also needs to know about the ancillary services required before, after and during a session — liasing with arrangers and copiests, coming to grips with cartage, and so on. In fact, the actual making of a record is pretty much the easiest part of the whole production. You've also got to deal with the union local . . . make sure that there's enough beer in the refrigerator . . . know what to do if somebody hits the record button and erases half your best lead vocal.

Having been on the receiving end, if you like, of a producer's guidance during sessions, I soon realized that he — or she, for that matter — is the *key* person on a recording date. In fact, I have developed two important guidelines to which I now faithfully adhere in the studio. The first is that I have access to serious input from *everybody* involved. I might even ask the guy who is wiping down the mike stands before a session if he's got any ideas. Possibly he heard something going down during the rehearsal — perhaps while setting up a microphone, or something like that. Music, after all, is spontaneity; a lot of people, even if they are not particularly musical, know what they like, and may catch something that I might have missed. I believe in using everybody's opinion, no matter who they are.

It also goes without saying that I rely heavily on my engineer for technical assistance, as well as input on how the session is progressing. During the last year or so I have been working with Bruce Robb at Cherokee Studios, Los Angeles, a facility I prefer because of its high level of reliability. That's all part of delegating authority: I must rely on the studio and its staff — particularly the maintenance crew — being of the highest quality. Also, it must be a place that sounds just right, and has monitors I can relate to.

The other guideline that I try and stick to is that a producer shouldn't *over-produce*. As a session guitarist I've found that the less you have to manipultate a session, the more you feel like working, and the more input other people feel they have. For example, I might spend an extra hour on something if somebody else tells me that they think it's a great idea. Why not, I may be sitting there with my mind in a total blank? I belive firmly in acting as a catalyst, of setting *everything* in motion, and then letting it run its course without too much intervention from me as the producer.

In addition, I think it a good idea to sort out all the pre-production arrangements before a session begins, and to know the band personally. I like to know their styles; what instruments they like to play; how they feel about maybe using other musicians in the band; and so on. I then try getting the band together in a rehearsal hall, going over the tunes, and listening to the way they play through sets of headphones. If I can get the money, I also prefer to put the band in a studio and cut a couple of sides so that *they* know what they sound like on tape. This can be very important for a new band that hasn't recorded before; it's less so, of course, for guys who are used to the studio environment.

I find that the more pre-production you carry out, the less you have to do in the actual recording. If the arrangements are together, your engineer knows what he is going, the tunes have been picked, and the spots for the solos are down, the session might not run exactly like clockwork, but it certainly is less horrible than it would be without some forward planning.

Organizing the session properly is also very important. I try and set myself some sort of deadline each working day. I might say that I want a track by 3:00 p.m. tomorrow afternoon, and then ask the band if they want to come in at noon or 10:00 a.m. The band might suggest noon — their way of telling me they feel confident that they're going to get me this track in three hours. But I also try and leave a little extra time. For every six hours that I work, I also leave an additional half-hour. That's the way I think — in terms of six-hour blocks; double sessions.

Although I might be delegating the technical side of a session to my engineer, there are often times — particularly when working with Bruce Robb — when we will interchange with one another. Because I trust his ears so much, there will be times when I walk away totally. I'll go out and have a cheeseburger, and let him do a vocal part. I know what he is going to come up with, and that the result is going to be what I want to hear. Occasionally, when Bruce is feeling tired, I'll engineer because I also like to be able to handle the technical side of a session. As a result, even though I'm the producer, and have an engineer and second in the control room with me that I trust, we work as an homogeneous team; quite often you can't tell who is doing what job at any moment in time.

That sense of team spirit is very important to me. If I've been listening to a guitar part for six hours, trying to get it on to tape and do a rough mix, I'm going to change places with my engineer, because he's got fresh ears. By the same token, I've got a fresh head for engineering. We swap roles to make sure that there is always a set of fresh ears in the room. If both of us are blasted after working for 12 hours, I've even asked one of Bruce's brothers at Cherokee to come in and take a listen to a mix. I rely on my friends, and am prepared to listen to input from anyone. Ultimately, I make the final decisions.

It's also important for me to continue doing session dates when I have the time. I still want to keep in touch with my roots as a guitar player. For one thing my sight reading will have improved when I walk out of a studio date and, for another, I will have to play something completely different with a bunch of new guys. It's like constantly going to the college of musical knowledge; Recording 101. It doesn't make much of a difference if

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views

"MUSICIAN-PRODUCER"

Jeff Baxter

I'm playing, engineering or producing, so long as I am working and learning in a studio situation.

I have now reached the point where I can enjoy playing and producing at the same time. A good example of this was a recent album I produced for Alfa Records of Billy & The Beaters, live on stage at The Roxy, Los Angeles. My engineer in the Record Plant Mobile parked outside was feeding me with a stereo mix for my stage headphones, and I could keep in touch with him by means of an intercom system. Even though I was part of the "informal" rhythm section — and managed the occasional solo from the stage — I could still be in close touch with what was going down in the Mobile.

I don't find it difficult to wear two hats during such a session, because when the sound is up — in other words, when tape is running — there is nothing that I can do except listen and play. Also, in being a part of the track, I find it easier to relate to certain quirks in tempo and other things in the track that I would otherwise question, or might not question because it relates to my playing alone. I can use the steadiness of my own rhythm as a yardstick, and get more of a feel of how the rhythm section is working, than just by listening to it. Actually being inside the music — being part of the basic creative process — is a great advantage for any producer.

The one thing that I can't describe is the feeling of satisfaction. Let's just say it is, at the very least, one of the finer things in life. □□□

A PROGRESS REPORT: THE STANDARD DIGITAL INTERFACE

by Richard Factor

Not so long ago, as we science people measure time, there was published in this Journal an article entitled "A Standard Digital Interface for Peripheral Equipment" (*R-e/p*, February 1978 issue). This article argued, with compelling clarity and sparkling wit, just why it was necessary for the audio industry to forthwith and instantly adopt the IEEE Standard 488-1975 for interconnecting automation-compatible equipment.

As a result of this article, virtually all manufacturers got together, enthusiastically espoused the IEEE-488 standard, and immediately began developing mutually compatible equipment, so that today almost all studio peripheral equipment is compatible, mechanically and electrically, and any automation system can control nearly any piece of peripheral equipment.

Right. And the moon is made of green cheese and I have this nice little bridge in Brooklyn available for just a few lupins and change of a hern. What *really* happened, as far as I can determine, is that 90% of the readers fell asleep between the word "A," and the word "Standard." A further 5% got lost elsewhere in the title, and perhaps a few stuck it out through the first paragraph. Which is really a pity, because I felt, and still feel, that the article said something that needed to be said. And just to prove it, despite the risk of losing everybody who has faithfully trailed these words up to here, I'm going to say it again.

We Need A Standard For Equipment Interconnection

The original article discussed the genesis and operation of the IEEE-488 bus, so I won't belabor the data protocols and mechanics here. This article is in the nature of a progress report. The "personal computer" has penetrated various strata of the audio biz and the collective consciousness. Digital technology has progressed substantially to the point where it's time to take another stab at convincing the industry that there is something worth considering here.

New applications, such as special effects in live performances and longer distance control of instruments, have been opened up by recently-introduced bus accessories. In the area of computer/controllers, the choices have increased, from essentially one at the previous writing, to at least five now. I shall attempt to summarize some of the competing interface schemes and explain the advantages/disadvantages of each. And, finally, I shall once again enter a plea of *nolo contendere* on behalf of IEEE-488. In non-legalese, there is no contest!

— *continued overleaf . . .*

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views

— STANDARD INTERFACE —

Richard Factor

Competing Interface Systems

Thereare several interface standards besides IEEE-488; and there are many purposes for interfaces. Before we consider them, let's define what we would like the interface to accomplish:

1) The interface is *not* to be used for transmitting audio information itself; a shielded pair is usually fine for that.

2) The interface is *not* to be used for transmitting *digital audio*. Although IEEE-488 could be used, it is not very efficient for this purpose since undoubtedly at least 16 bits will be needed, and the sophisticated addressing and bus control features will not be needed.

3) It is for transmitting *control* information, i.e., to allow a computer to adjust all the controls the mixer normally adjusts, but much faster and more accurately.

In addition to IEEE-488, several interface "standards" have been suggested. There is the RS-232 standard, a bit-serial interface that is very popular (almost to the exclusion of any other) for data communication. There is the "EUBUS," a scheme promulgated by Eumig, a manuacturer of automated tape cassette machines. And there are countless others, most very specialized. If anybody knows of an especially popular one, I'd be

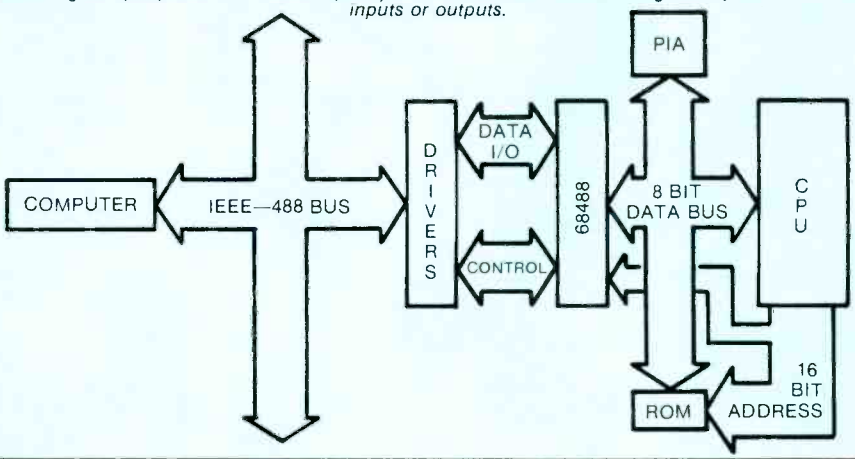
A Brief Summary Of The IEEE-488 Bus

The IEEE-488 bus is a mechanical and electrical standard for connecting electronic instruments from various manufacturers, without the specific cooperation or even knowledge of the manufacturer. It allows up to 16 physical devices (any of which may have an unlimited number of functions) to be connected to the same cable. The cable itself is a 24-conductor wire, which has a male/female "piggyback" connector on each end. Individual cables typically come in 1-, 2-, 4- and 6-meter lengths with these connectors attached, although there is nothing precluding one from making his own cables. The total cable length should not exceed about 60 feet, although the standard implies that exceeding this length usually results in nothing worse than loss of speed.

Data are transmitted over the bus on eight *data* lines, allowing transmission of a byte at a time. Eight additional lines perform *bus management* functions, including notifying the devices on the bus whether information being passed along the bus is *data* or *address* information. Additional lines allow each device to

. . . continued overleaf —

A conceptual block diagram of the microprocessor portion of the IEEE-488 interface, showing how the internal MC6802 microprocessor and its associated ROM are interfaced to the outside world via the 68488 GP-IB chip and bus drivers. The PIA transfers data from the CPU to a Harmonizer. A PIA (standing for "peripheral interface adaptor") has 20 lines that can be configured by the CPU to be inputs or outputs.



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- **Village Recording** — California, Studios D and B, Control Room A
- **Frank Zappa** — California, New Studio
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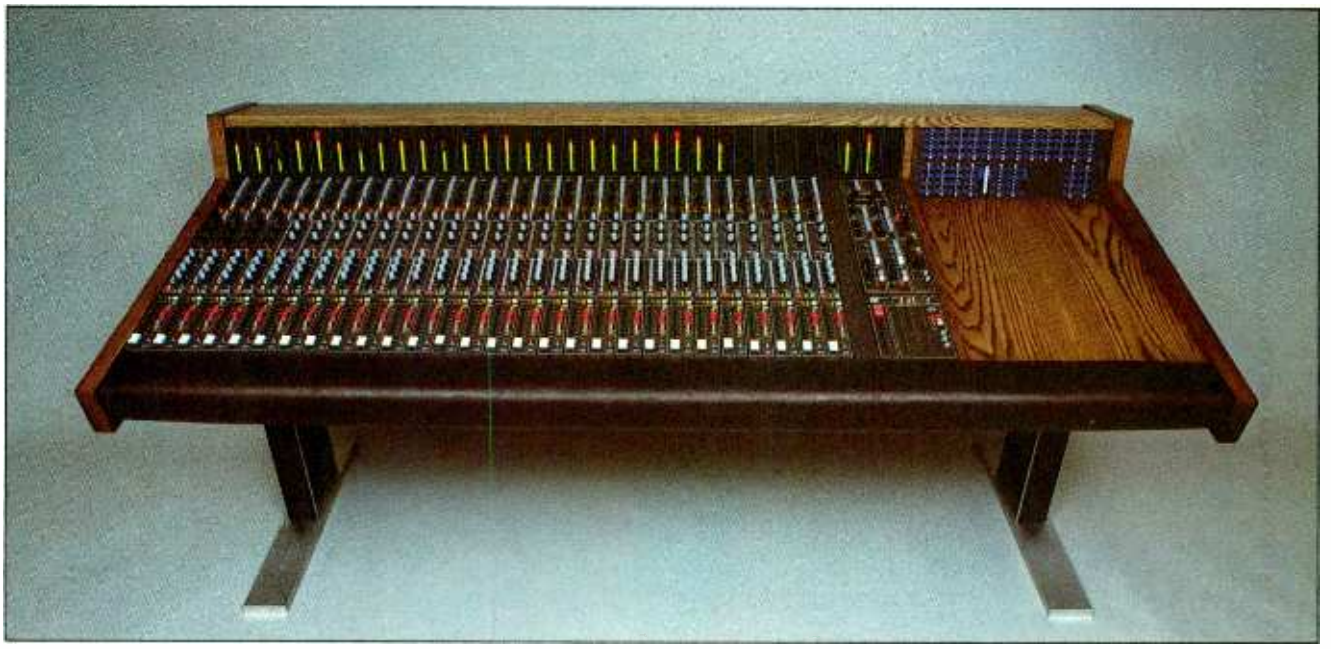

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views

— STANDARD INTERFACE —

Richard Factor

happy to find out about it and consider it in the light of the following discussion.

The RS-232 standard is potentially ideal. Electrical implementation is cheap, requiring typically from three to seven connection wires. It is even more nearly universal throughout the electronics industry than the IEEE-488. But, it has one major problem: *Speed.* Without going into the bit-rate computations (see previous article), it turns out that RS-232 simply is not fast enough to update control settings on multiple units. IEEE-488, operating at a maximum rate of 500 kHz with 8-bit words, is potentially 325 times faster than RS-232 operating at its normal maximum rate of 19,200 baud. (My arithmetic is not suspect — RS-232 wastes two bits for each byte transmitted for start and stop signals.) Whereas under some circumstances RS-232 might be fast enough (such as in controlling a tape machine which can be told to Start, Stop, FF, FR and Record all in one byte), it certainly wouldn't be fast enough to control complicated effects units, or an equalizer with eight channels, four controls per channel, and three digits to be sent per control.

If one RS-232 channel were devoted to *each* instrument, it *might* be fast enough. And then again, it might not. Additionally, the cost of adding RS-232 interfaces goes up linearly, and multiple-user software is expensive and difficult to write. Imagine the problem of 10 peripherals trying to talk to the console simultaneously on 10 circuits which don't necessarily have handshaking hardware! After absorbing the higher initial cost of the IEEE-488 hardware, the cost goes up slowly since all that is required are additional connecting cables. While RS-232 is viable under some circumstances, I don't feel that the industry should be saddled with the very limited capabilities of this interface system.

In many respects, the EUBUS is similar to the IEEE-488 interface. It is a less complicated system, in that it does not have all the bus management functions of IEEE-488, and works with 4-bit nybbles instead of 8-bit bytes. This system, had it come along earlier, might very well have been acceptable. Although its speed and versatility are lower than IEEE-488, due to the lack of bus management and the half-width data bus, its speed is probably adequate for any reasonably projectable control requirements. It also solves the handshaking problem in a manner similar to IEEE-488.

Why then not use it? Several reasons. First, it is somewhat less versatile. The half-width word makes it impossible to send ASCII (alphanumeric) data, which means that data will either have to be restricted to binary form, or synchronized to distinguish which half is which. This increases overheads. And, of course, many bus management functions are missing. "Aha," you say. "Didn't you just say that you limited your bus management functions to the very simplest subset?" Yes, I did. But that doesn't mean that we will always want to limit them. There are a lot of capabilities built into the IEEE bus that aren't yet being used.

A primary example is the SRQ (Service Request), which allows peripherals to get the attention of the computer, with such potentially vital messages as: "Disconnect me; I'm not working correctly!". It would be a shame to give that up for apparently seductive simplicity. And I say "apparently" because implementing the EUBUS is actually more difficult than IEEE-488, even though it's a simpler system.

How to explain this paradox? Integrated circuits to implement IEEE-488 already exist and are reasonably priced. EUBUS chips do not. It's as simple and as unfortunate as that. And, of course, there's always politics. Before another cassette machine manufacturer would use EUBUS, he would have to change the name and have an embarrassing time explaining it to upper management. (Much as Tektronix must have had to do when they decided to use the HP-

IEEE - 488 Bus . . . *continued*

signal the *controller* that it wants attention. Three of the lines perform a *handshake* function. The final eight lines are *grounds*, both for shielding and protection.

A unique feature of the bus is the *three-wire handshake*. This (HP-patented) feature allows the controller to send data to multiple devices without respect of the speed at which each can accept data. The three-wire handshake protocol tells the controller not to send further data until each device has accepted the data already present.

Devices on the bus may be *controllers*, *talkers*, or *listeners*, or any combination of the three. As examples, the computer or automation console would normally be *controllers*, since they are controlling the operations of the system. A printer would normally be a *listener*, since data are passed to it and then printed on paper, not sent along the bus again. (The bus management lines in this case allow the printer to signal back that it has a problem, such as being out of paper.) Most instruments, such as frequency response analyzers and effects units, are both *talkers* and *listeners*. The Harmonizer, for instance, is a *listener* when it is receiving instructions with regard to mode of operation and pitch ratio. It becomes a *talker* when the computer requests information, such as the settings of its front-panel controls or the present pitch ratio.

The rather complicted protocol required by the bus is defined by the IEEE in a series of state diagrams detailed in their standard document. However, one need not know (or even be aware of the existence of) this protocol, because at least three manufacturers — Motorola, Intel, and Texas Instruments — make integrated circuits which perform bus functions automatically and at low cost.

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IB — re-named "GP-IB", and finally, of course, IEEE-488).

So, what's holding us up? Implementation is simple. Cost is reasonable. Versatility is enormous. Political acceptability should be assured. What is it? I think the answer must be: *Inertia*, pure and simple. Well, we're committed to the 488 standard, and by way of tantalization, in the rest of this article I'm going to describe a few of the things we will be doing involving the bus, and a few possibilities inherent in hardware available *today*.

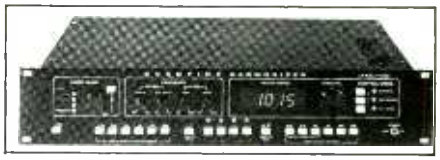
Remote Controlling The Harmonizer®

Eventide's first remote-controlled interface was designed for the 1745M digital delay line. This DDL is a modular instrument which has a "mother board" with five card slots. Thus it is possible to obtain any combination of pitch change, output, and remote control modules using up to five slots. (Of course, there would never be reason to use more than one remote control.)

The remote control functions available for this unit are relatively limited: it is possible to set the delays of pitch change and output modules; the 2X delay and repeat functions are also remote controllable. Since the DDL lacks an automatic flanging function or randomized delay function, it was possible to have the microprocessor on the remote control interface generate the delay settings for these functions. The major limitation of the 1745M DDL is that, although the design of the main frame would allow remote control, it would not allow manual settings to be read by computer. This limitation — and we shall see why it is a serious one — has been overcome in the H949 Harmonizer remote control.

Why New Capabilities Are Desirable

The major problem with the DDL, as mentioned above, was the impossibility of reading manual settings by computer. Why is this important? Let's look for a moment at a standard automation console. When you are mixing, the computer automatically logs (usually on tape) the various fader (and sometimes EQ and other) settings. Then, when you are happy with the settings, the computer can recreate them, leaving only a few modifications for the (human) engineer to perform during the mix. If the computer



could not "read" the fader settings, however, automation would require some other way of communicating the desired settings to the computer.

As an extreme example, consider how undesirable it would be to type fader settings into a terminal, one number for each fader, and one entry each time any fader had to be changed! And yet, this is precisely what has to be done if one wishes to vary delay times during a mix using an automation controller. Of course, most mixes require far fewer delay lines than they do faders, and the delays are less frequently changed. But still, wouldn't it be nice if one could operate a peripheral normally, and then have the automation recreate its settings as well? Enter the H949 remote . . .

The Harmonizer has many more controls and functions than does the 1745M DDL. Parameters likely to be set on the DDL are basically Delay, Pitch Ratio, 2X and Repeat. Although the Harmonizer does not have the 2X feature, it adds eight modes of operation, three sources of pitch control, and two de-glitch algorithms which must be selected. Any of these functions can be changed at any time. Wouldn't it be convenient if the mixer could adjust the controls during a mix and

. . . continued on page 30 —

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Real Live Example
Of Computerized Control

Stephen Katz is a sound and Dolby consultant to many Hollywood film projects. In addition to his credits on *Star Wars* and *Close Encounters of the Third Kind,* he has also worked on *Altered States.* Steve bought a Commodore PET computer only weeks after it was introduced, and has used it with a panoply of bus-compatible equipment in his sound work.

Steve's setup has evolved both with hardware and software. On his latest, still unreleased project (*The Hand*), he used the synthesizers as signal generators and the computer-controlled delay lines and DACs to give the sonic illusion of "The Hand" crawling from place to place — doing whatever it is that hands do when they're unattached. In the Ken Russell film, *Altered States,* the setup was again used to give special perspective to various actions using combination of computer-controlled delay and amplitude.

In using the computer setup, Steve finds it convenient to preset various effects to occur at specific times in a given reel of film.

The computer-control is also of help in modifying sound effects, used more widely in film than in music recording. Frequently it will be necessary to change the ambience as a scene cuts from one perspective or location to another. It adds realism to cinematic effects when the audio effects can be shifted simultaneously with cuts; say, from a closeup to a long shot in a large room. When the cut to a long shot is made, the delay time and amplitude may be instantaneously changed to subtly remind the watcher that his viewpoint has shifted.

Steve finds that being able to pre-set effects also saves a lot of time during the final mix, since the computer in effect allows different elements to be rehearsed independently and then combined in real time.

Film-sound consultant Steve Katz' workshop, in which a Commodore PET computer is used to remote control a pair of Eventide 1745M DDLs and H949 Harmonizer, via an IEEE-488 bus. Remote control of a specially-designed unit that houses four digital-to-analog converters, used, for example, to pan sound sources around a four-speaker monitoring array during the fabrication of sound effects for Dolby Stereo film soundtracks can also be achieved from the PET.

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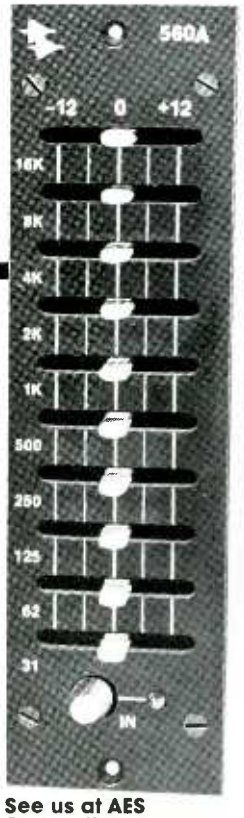

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views

— STANDARD INTERFACE —

Richard Factor

not only have the computer read and retain the new settings, but actually log the time at which they occurred. Then, when recreating the mix, it could perform all the changes simultaneously! (Of course, this may not necessarily be desired — such as in cases where a slow sweep of pitch is desired — but doing it either way is well within a computer's capability.)

Reading The Front-Panel Settings

How does the computer know what the device is doing? When the Remote-Control option is installed, all control lines from the H949's front-panel board to its signal processing circuitry are, in effect, physically intercepted by the remote module, which mounts behind the front panel. When the unit is turned on, the remote-control microprocessor initializes itself and the circuitry, so that the front-panel controls work just as if they were still connected to the rest of the unit. However, all the control lines are connected to circuitry on the remote unit, and the processor can tell the state (on or off) of each of the switches and buttons. If, for instance, the repeat button is latched in, a particular line goes to a logic 0 (ground voltage level).

The Harmonizer is operated remotely by commands from the computer. For example, if you want the Harmonizer to enter the normal pitch change mode, you would have the computer send "P" to the H949. If you then wanted a pitch ratio of 1.07 (approximately one semitone up), you would then send the command "H1070." All these command are automatically sent to the unit because the computer knows its "bus address." If you had 10 devices connected to the bus, the computer could address each of them individually. And the cost of the additional connections would be that of the cable alone — no additional hardware would be required!

To get back to the main point: one of the new commands available for the H949 is "W." This simple letter opens up new possibilities for automation. When the "W" command is sent on the bus, the unit is automatically reconfigured to "W"rite data back to the computer.

First, the data from all the front panel controls is read by the microprocessor. Each of these control states is turned, in effect, into its English equivalent. To use the above example, if the Repeat switch is latched, the processor takes this bit to mean that the characters "RPT" are to be sent back to the computer in response to the "W" command. A bit more intelligence is used for the delay settings. Each delay switch on the H949 front panel corresponds to a certain amount of delay; the total delay is the sum of the delays of the switches depressed. Since the processor knows when switches are in, it can take the decimal values, add them up and transmit the sum. Thus, the processor will

. . . continued on page 186 —

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CBS vice president A&R... producer—
TOM WERMAN

by Robert Carr
Photographs by Kathy Cotter

Tom Werman occupies a possibly unique position within the recording industry. As Vice President of Artist & Repertoire at CBS Records, he is responsible for discovering and grooming new talent. He believes, however, that there is a special cohesiveness that exists between a band and himself as the producer — especially if he has been responsible for the band being signed to the label. That his managerial judgement and production skills are equally tempered is illustrated by Tom Werman's collection of four Gold and eight Platinum albums. He has produced sessions for Cheap Trick, Ted Nugent, Molly Hatchet, Blue Oyster Cult, Gary Myrick & The Figures, The Hawks, and lately The Producers.

R-e/p (Robert Carr): I'm impressed by the fact that you seem to have a good balance between your position as Vice President of A&R at CBS, and your role as a hard rock music producer. And, of the last 16 albums you produced, four have gone Gold and eight have sold Platinum. Is there a correlation between keeping a balance between the executive and creative roles, and selling so many records?

Tom Werman: Yes. My being able to produce the acts that I sign is an insurance policy against failing with them. In other words, most A&R men will sign an act and then get a producer for them. Their vision may be one thing, and the producer's something else. The A&R man will blame any failure on the producer, but he will have to eat it for signing the act anyway — if the act is a stiff. I can combine the two roles and raise my chance of success, I think. Interestingly, all of my Gold or Platinum albums have been with groups that I've signed. That's something I'd like to remedy immediately. I think I have with this Hawks album that I produced for Columbia, and which came out just recently; we'll see. There is really no sophisticated busines acumen that's necessary to sign good groups.

R-e/p (Robert Carr): I'm also thinking in terms of whether or not there is tension between the two. Maybe there's something you would know as an executive, which may make it tough when you go in to produce. That you may start thinking as an executive, rather than trying something creative.

Tom Werman: I don't find that. One of the good by-products of that is that you always have an eye on the budget, because I know approximately what all the hidden costs are, and how the company works. I can foil that operation. [Laughter] I can try to help out both the group and the company, and try to make the process as economically efficient as possible without compromising creative efforts . . . I hope.

. . . *continued overleaf* —

"at CBS? . . . no, we're not cutting back on [production] budgets — we're cutting back on inefficiency in terms of shorter hours in the studio . . . there was a tremendous amount of waste in the past!"

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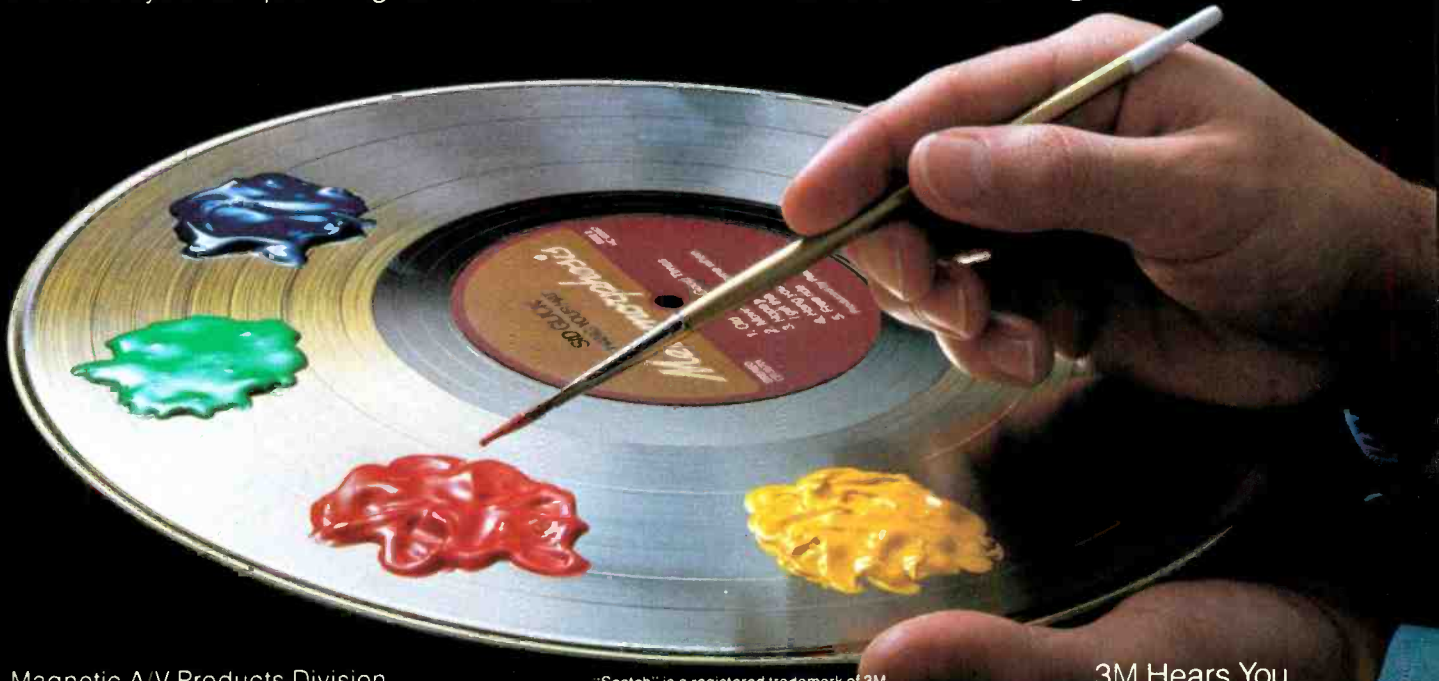

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R-e/p (Robert Carr): So you seem to have some kind of rapport with the groups you sign, which you may not with another band.
Tom Werman: Well, there is an element missing, I think. Rather than say it negatively, it should be put positively. There is an added element when I am producing a group that I sign: I'm a real fan. There was no conscious decision made to accept or reject any project that was offered. It was seeing, hearing, and instantly falling in love with the group, and saying, "Boy, was that a great group; I love that group." The natural inclination is to say, "I would love to work with that group," not "Boy would I love to sign them." That's not enough. It used to be enough. It *had* to be enough, but after a while it became, "I know exactly what I would like to with that group, so let me do it, please!"

R-e/p (Robert Carr): A lot of what you attribute to having a hit record is really your energy behind the group?
Tom Werman: It's the vision that I have when I hear the group. In other words, with Ted Nugent, he wasn't doing anything different before we made our first album together, but he never quite envisioned his music the way I did. I had a sound planned for him that he hadn't considered previously. And it worked, whereas the previous ones didn't.

R-e/p (Robert Carr): What did you do to change his music? Was it anything drastic, or just cleaning up a couple of things?
Tom Werman: Nothing drastic — a mix approach, you know; getting a more powerful mix. Trying to get him into the stereo-double rhythm guitar approach was very important. I thought that rhythm guitar was his main strength, not lead. It's like Pete Townshend; his rhythm guitar is his strength. There was no drastic change in Ted's music. I think it was just more carefully done, and also the fact that he was on a different label. Having a different manager didn't hurt either. It wasn't miraculously as Werman stepped into the picture, Nugent's album went double Platinum. That was the first time I ever heard Ted Nugent sound like he was supposed to sound. In other words, I thought he was missing the boat before that. The same thing with Cheap Trick and Jack Douglas' first album. It didn't match my vision. I did what I had to do to make them commercially potent.

R-e/p: Is there a certain strategy you could zero in on that you could follow with the group? Let's say for the first two or three records you would want to keep it fairly consistent in terms of the style or the type of music they did. Once they have a loyal audience, you can start experimenting with them — taking them into different directions?
TW: It doesn't have to be two or three records. It can just be one; preferably it will be

one. As fast as we can I want to be let loose. It would just depend on record sales; upon acceptability. You'll be creative as soon as you start, but as to the number of commercially marginal chances, obviously those are going to be fewer when you are trying to gain popularity for the group. Normally I work with new groups and I'm very often in a position of asking myself, "How can I make this group different enough to stand out from the rest, but familiar enough to catch everyone's ear?" They have to deal in a musical language that people are familiar with, so as not to alienate them. But they also can't do what everyone else is doing.

R-e/p: Let's say you have only one album out — the first album — that has been very successful. Would it really be enough to lock the fans in if you took a different direction on the next album? If you were to do two or three albums, the fans would be more loyal and might go for a more radical departure.
TW: It depends on the group completely; it depends on how much they change. Ted Nugent was very consistent in his musical approach, and his material didn't change very much. Cheap Trick had some change. Molly Hatchet is also pretty flexible in its approach. They're learning to expand their boundaries, but you expect different things from different groups. Look at the huge changes that the Beatles and the Rolling Stones went through — especially the Beatles. You don't want to be completely schizophrenic in your approach, but you want to continue to give people something new. It's no fun for me to wake up in the morning and say, "Oh, boy, I get to go to the studio today, and make an album just like the last one." That's a bore — I want to take a few chances.

R-e/p: The Beatles recorded several albums with a very consistent, identifiable sound. It wasn't until Revolver *that they really changed.*
TW: Yeah, but that wasn't planned. It wasn't a conscious effort to stay in the same place. They just woke up and started to learn, or started to say, "Hey, we can do this; we can do that. Why should we stay in this same safe territory?" It's just that the instant success gives you the privilege of departing radically. Whereas with the normal route up — which is that the first album does 100,000 (if you're lucky), the second a quarter of a million, and the third 400,000 — then you still have to be careful. You're still looking for the magic hit single. It's really much more fun if you can just avoid all that. I tried to make albums that would sell *regardless* of singles. I don't have many hit singles. I would like to, just because it's an area I don't know that well.

R-e/p: Would you say that getting into rock and roll was a rebellion against your early years in Boston, attending private school?
TW: No, I was into rock and roll very early on. I introduced my classmates to Bo Diddley, and was playing the guitar in high school. But college was the first opportunity I had to get into a band; then I started to take it more seriously. Actually, no one really took music seriously until after the Beatles.

R-e/p: Did experiencing what a musician goes through help you develop an empathy for the groups that you work with now?
TW: Yes, absolutely. We played tons of fraternity dates, and got to them by loading up normal passenger cars with amplifiers and guitars, trudging through the snow, and carrying our amps on our backs. There was no such thing as a roadie in those days; no PA, no monitor, nothing. We were real good at improvisation. However, it did teach me to have a lot of compassion for struggling musicians. We didn't think there was any other kind. The group that I have just finished — the Producers — didn't even had a roadie. They had *never* had one, and they're a really fine group. That made me pause when I said, "What, no roadie? . . . oh, yeah, we never did either." They're doing the same club dates, and they pack everything into a couple of big vans and go.

R-e/p: Regarding your pre-production technique, I understand that you get a rough copy of the songs the group has written, and listen to them maybe 10 or 15 times. Then you write little notes to yourself about what's good, what should be changed, how to strengthen a lyric or lick. Which suggests to me that by listening that much, you're really getting involved with the music on a very basic level. Is that a conscious effort on your part?
TW: Well, sure. It's a conscious thing to get involved with it on a basic level, so that you understand every turn the music makes. That's very important, because then the musician really respects you. I've seen instances in which the musicians are surprised, because I know the song better than they do. Each guy might know his *own* part, but he has no idea what the other guy is playing. He will say, "I never knew you played that." If I said, "Look, you guys lay out, and you two guys play your parts together, because there are notes that clash there," or, "You're pushing that beat and he's not; he's laying back," they'll say, "Jesus, I never knew that." That's what comes from microscopic examination, but the kind of examination

. . . *continued overleaf* —

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"It's a mistake going into the studio with a band that's loose ... if you're not together, you're not making good music ... that's all!"

that I perform on the music is not conscious. I just play it, and play it, and play it. I don't sit there like "Nipper" cocking my ear at the loudspeaker. I do other things, and I play it in the background until something disturbs me. When it disturbs me or distracts me, then I say, "Something is wrong there." I try to identify it, and talk to the group about it. Sometimes I don't know what's wrong, but I know it's something. I say, "This particular passage doesn't make it, it's too twinky or too aggressive for the song," or, "I want to hear it again, let's double that." That approach seems very natural to me. I think if most producers don't do it, they ought to, because when you make the record you have to know every note of every instrument. It really helps out in mixing.

R-e/p: Well, you know when everything is coming up. It's as if you're playing all the parts at once.
TW: That's right. It cuts down pre-production, too. I make final notes, and I go in and say, "Okay, Song X — everything was okay except three things: I thought the bridge was misplaced, I thought the solo was twice as long as it should be, and I think you should zip the intro." Then we'll discuss each one by itself, try it out, and say okay or no. If it's no, then we try something else. The guys work on it and we do it again the next day.

R-e/p: Your role is one of being very passive in the sense of letting them come up with parts. You just make sure it's working correctly, or that it's all meshing?
TW: A producer's part in the beginning *has* to be passive, because he has never heard the band's material before. So it's like, "Give me what you've got. I'll listen to it, and tell you what disturbs me and what thrills me." That's all.

R-e/p: It's a completely different situation from having an artist and then getting a band together, where you at least have a rough direction of where you want to go.
TW: Yeah, that's right. You become more active as the project goes on. Your role become less passive and more active until it's almost all active.

R-e/p: But you say that you don't want to leave a print of any kind on the music that would be indentifiable as your production style. But in a way, isn't that *a style?*

TW: No, it's not a style, it's an approach. It's a work procedure; not something one can hear. When I say *style,* I mean identifiable sound. There are certain people whose drums you can identify, or who do vocals one particular way.

R-e/p: On a lot of the tracks you've produced, the bass and drums are in the center and low, with the lead vocalist and lead guitarist or lead instrument positioned a little higher in the center. And then it would be either stereo guitar, double tracking, or something which would pad the sides and

". . . it's the old-house-built-on-a-weak-foundation business — if you don't have a perfect, or near-perfect drum track, you're going to spend the rest of the album trying to correct little things."

create a sort of pillow of guitars all around. That was fairly consistent.
TW: Yes, it is. I don't think that the stereo picture of a song is necessarily a telltale sign of the producer. I like that for most songs and most groups. It seems to be a very comfortable way of recording, and if there is one thing that I do lean on, it would be doubling rhythm guitar. But I think it's as common as double-tracking a voice now. So it's not a case of: "Ah ha, a double rhythm guitar — it must be Werman."

R-e/p: I'm thinking in terms of placement though, too. That placement would characterize it as a "Werman Creation."
TW: Well, sometimes it is extreme left-right. Sometimes it's half, a little more towards the center. Both of them are a little more towards the center. Once in a while I don't even double the guitar at all. Maybe once on an album. [Laughter]

R-e/p: Do you visualize those different panning positions, or do you put on the headphones or monitors and just feel where they are going?
TW: Actually, my regular engineer, Gary Ladinsky, sets it up in the beginning, and if he has any questions about it, he'll ask me. Usually I let him listen to it and, by the time he's ready to mix, he's heard the song so many times that he has a really good idea where each instrument should be in the stereo spectrum to give it his best shot. I really don't pay that much attention to panning. I don't leave the control room saying, "Now listen. When you set up the next mix, make sure these are the positions of all the instruments." Each engineer has his

. . . continued on page 39

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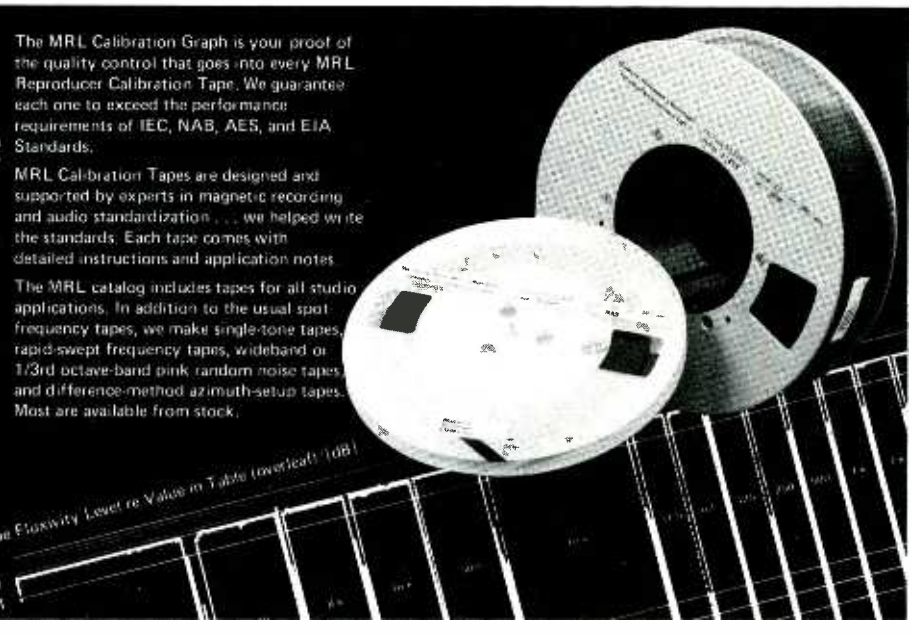

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own favorites.

R-e/p: It's not necessarily how they would set up on stage, that you particularly put them that way in the track?

TW: Most of the time that is what we would do, except you can't put the bass off to the right. Well . . . you can. The Beatles did, but I don't enjoy it. Usually the drum kit is the way you see it.

R-e/p: There seems to be such an emphasis on getting the bass and drums so tight, you may have the entire rhythm section in there — meaning guitars and keyboards with the bass and drums — but that everything else is erased except for the original bass and drums.

TW: In my case it's usually — unless I get really lucky — everything except the drums. I try to get the groups to agree to go for a drum track. Anything else that happens to work is fine, but if we get a great drum track and they don't mind, then we re-do the bass. We'll punch in on errors or do the whole bass track over again, then stack and build the record from there. It's nothing that I espouse; it just turns out to be the best way to make a tight record. It's the old "house-built-on-a-weak-foundation" business. If you don't have a perfect or near perfect drum track, you're going to be spending the rest of the album trying to correct the little things.

If I discovered that the track was developing into a robot song, then I would suggest that we put two or three guys in there together. Normally, everybody does hear a mix of everyone else in the cans. We don't just say, "You guys play along for the hell of it." We say, "Come on, give it your best shot." I don't run into that problem very much. Maybe it's because the drummer — if he's good — doesn't need anybody else to define the rhythm. See, the bass player should play to the drums. By the time you've got drums and bass, if their musical attitude is right, it should be relatively simple for the guitarist to play a rhythm guitar part that feels good. By the time the keyboard guy gets on, then you've got a band already underneath him so the feeling is there.

Hopefully the band is tight enough. I wouldn't have made a mistake of going into the studio with a band that is so loose they couldn't do their parts one at a time, if necessary. I'm pretty picky about the band being tight. I don't think music, by my definition, includes bad time. Music is a rhythmic thing. If you're not together then you're not making good music. That's all.

It's also a very commercially potent force. You'll probably notice if you go back a few years — especially to groups like Fleetwood Mac — that all the really big singles during the past five years have had an impeccable bass drum/bass marriage. They had to play as though they were one. The average listener in America has a highly trained set of ears, because they've had so much practice. They've become experts at judging what they like and what they don't like. I think that if you gave them a multiple-choice questionnaire that asked: "Which of the above factors do you think is most important in this record?," or, "Which of the above factors makes you like this record most?," and you separated out things like overall rhythm, bass drum or bass and drums together, guitar part, and so on, I'll bet a lot of them would go for bass drum drive and punch. That's the punch you hear on your car radio that makes you drive faster. Often the easiest things to hear are the high vocal harmonies, the "twinkly" keyboard and the screaming guitar lines, because they are in a range more accessible to the human ear. But the bass parts you feel as well as hear — and that also happens to be the first thing that goes down. So, therefore, that's the first thing you run into in the recording process.

R-e/p: Regarding your mixing philosophy, do you usually do all of the tunes, and then mix them all at once, or do you do a tune and then mix it?

. . . continued overleaf —

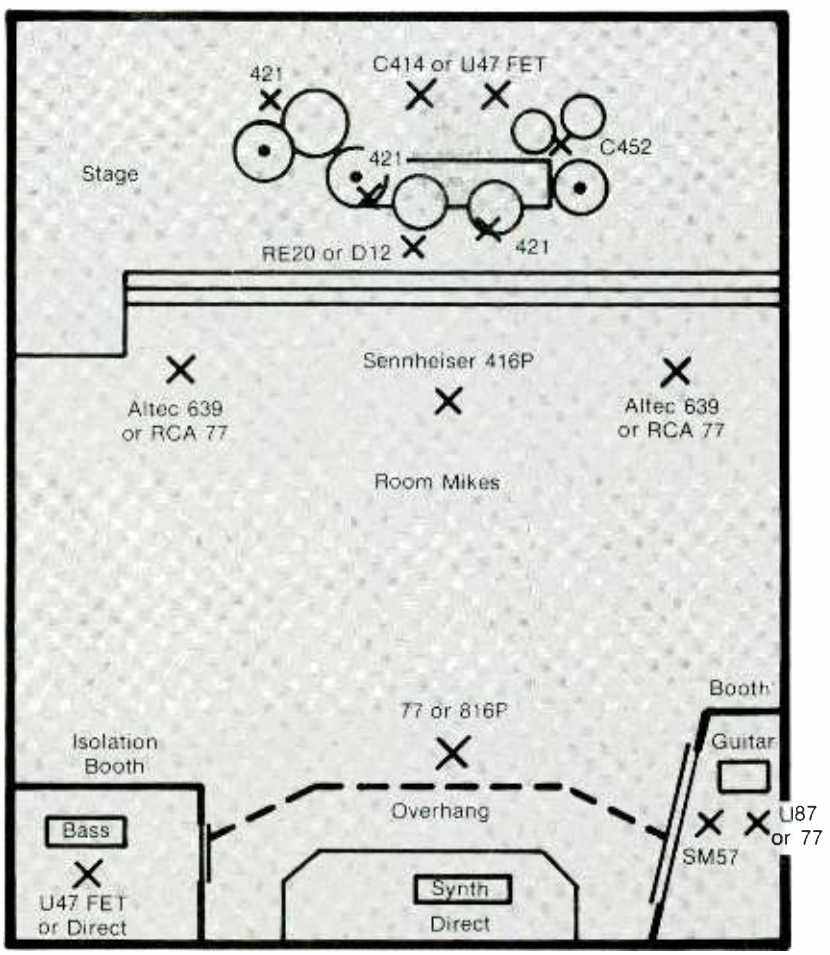
BASIC ROOM/MICROPHONE SET-UP FOR A TYPICAL TOM WERMAN TRACKING SESSION
engineer — Gary Ladinsky / studio C — Record Plant, L.A.

Shown below is the basic mike placement layout for a tracking date in Studio C at the Record Plant, Los Angeles. The setup is modified by depending on the individual groups instrumentation, and the particular studio design. Keyboards such as organ and piano are always added as overdubs after the foundation of bass, drums, and guitars is solid and tight. Synthesizers, because they don't require isolation and can be recorded direct in the control room, are sometimes tracked with the rhythm section.

Where two or more microphones are listed together, engineer Gary Ladinsky chooses the best mike or combination of mikes for the sound he's looking for; for example, he may set up four mikes for the guitar, and then choose the best one. If one alone doesn't suffice, he mixes together any combination of microphones on to one track unitil everyone is satisfied.

Gary started working with Tom Werman in January 1978, on Cheap Trick's *Heaven Tonight* album, and has completed nine projects to date, including Molly Hatchet, Off Broadway, The Producers, and B.O.C.

Drum Miking:
Kick — E-V RE-20, or AKG D12
Snare — AKG C452
Hi-Hat — AKG C452
Toms — AKG C451
Overheads — AKG C414, or Neumann U47
Room Mikes: Altec 639, or RCA 77
Shotgun Mikes: Sennheiser 416P and 816P
Bass: Direct-injection and U47 FET
Guitar: Shure SM-57, RCA 77, Neumann U87 and U47 (one or two in combination)
Synthesizers: Direct-injection
Piano: AKG C414s
Organ: AKG C452 on top, and E-V RE-20 on bottom



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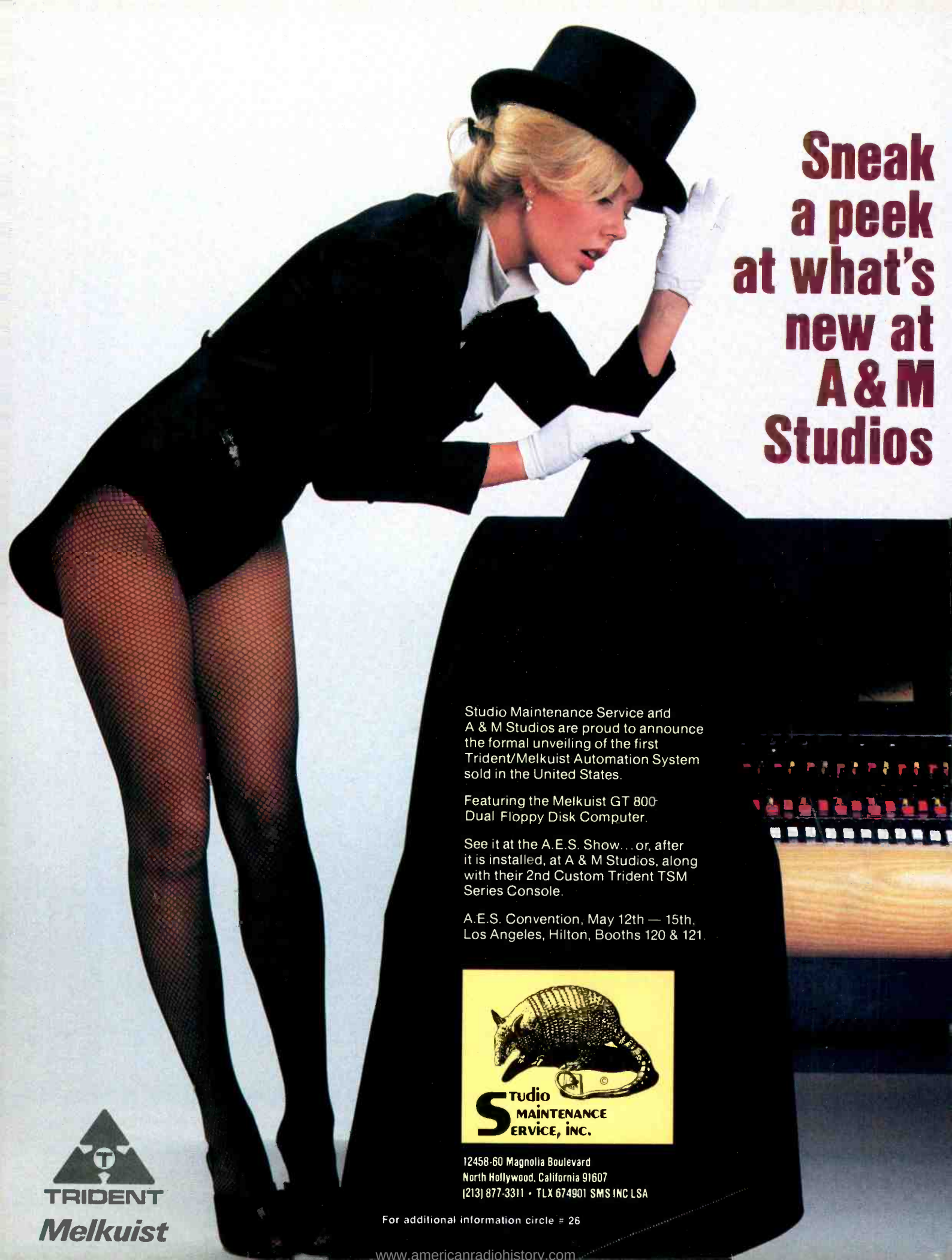

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mixing? . . . "I'm sure I'd have some regrets if I recorded a song in a day or two — and then mixed it the next day. I have to live with it, again, and again, and again, until it's as right as it can be."

TW: No, I mix them all at once. I finish everything unless there is a little percussion. On half of the songs I'll add something at the very last minute; in other words, while we're mixing, I will go in and record a tambourine or shakers or a cabaza or a two-by-four.

R-e/p: So, quite a bit of time could go by between the first song that's recorded, and the time it's mixed. Do you loose your perspective of the song; or do you actually get a new objective point of view?
TW: I don't lose my perspective of the song.

R-e/p: You may be into a flow with that particular song as you are recording it, and then want to go right into mixing, because you have all these ideas fresh in your mind.
TW: Oh, no. I would never do that. I wouldn't trust myself to put everything that was required into a song in a matter of two days. I have to live with it, and examine it again and again and again, until I'm sure that it's right, or as right as it can be within the constraints of time. *Then* we can mix it. I'm sure that I'd have many regrets if I recorded a song in a day or two, and then mixed it the next day. I think that would be real bad.

R-e/p: I notice that if I like a song right away, usually within a short amount of time I won't like that song. Whereas if there is a song that I don't particularly like when I first hear it, and I get into it over a period of time, I'll still come back and love that song — even if a number of years pass.
TW: That's interesting. I feel that the songs I love immediately, I love forever, and there are very few of them. With songs that I have to get into in order to appreciate, there is a bell-shaped curve: I'll like it, then I'll like it intensely, and then my interest will drop off. I won't *dislike* it after that, but I won't like it as much as I did as soon as I got it. Songs that I like immediately are magic. I hear three or four of those a year, and I like them forever. I hardly like anything immediately, I'm really slow to warm up to certain songs. Some of Police's material works like that on me.

R-e/p: Do you think that the hard-rock audience is diminshing? The Baby Boom buys a lot of records, but they seem to be going more middle of the road.
TW: No, I don't think it's diminshing. I just think we have grown out of it for some reason. I can still enjoy good metal music, but I enjoy much less of it now. I tend to think it's because most of it isn't very good. I knew something was going on when I started listening to Gerry Rafferty and loving some of his songs. I started getting into vocals and tunes instead of power and guitar licks.

R-e/p: With a hard rock group, the essence is the raw energy involved and transmitted. As the group progresses, their albums become more slickly produced — more under control.
TW: They have to be. It's hard to find a group whose music has become less controlled and rougher as they go on. They learn about things in a studio, and they use them. But if the material keeps growing then the group can last a long time. Look at the Stones.

R-e/p: Is there a plan of attack that you can follow with the group to ensure longevity within the hard rock medium?
TW: No. There might be, but I don't think anybody knows about it. It's not that kind of animal. You can't plan. Every time you go into the studio you have to assume that it's going to be the first of a long line of hit albums. Otherwise, you aren't going to really try. You aren't going to say, "I don't know; maybe we'll

get lucky and have a hit, but I'm not going to really count on this, because I don't want to be disappointed." You really have to say, "This is it! We are going to make hits here." A lot of it has to do with motivation; positive thinking.

R-e/p: Let's say you have an artist, a solid song, a pick-up group of studio musicians, and the concept or direction. Is there a way that you have to motivate those musicians — to lock them into a particular cohesiveness?
TW: You have to be like the movie director and say, "Let me paint the scene for you. I want people to feel this when they hear the song." You have to do that for a self-contained group, too. It's even more important for them, because they're not used to interpreting, whereas pick-up bands are. I have to get the self-contained group excited again about its own material. I have to say, "Damn, this is a *great* song! Look, it gives me goose bumps when I hear it." And they might reply, "Well, geez, if he likes it that much, it must really be good." You make each song special in its own way; you have to be able to identify the two or three favorites on the album. It may be a really good album, but I have got to say that particular songs are *absolute killers*, and still preserve the importance of the other songs on the album. You just can't say that here are three good ones, and the rest are all turkeys.

You have to manipulate and exhort all the time, but you can't lie to the band. You can't tell them that this is a great song, and meanwhile hate it. There's no cheating in the studio. That's the real blessing of production — the procedure dictates itself. You don't really have to worry about goofing if your taste is good. You know you are going to object automatically to those things which are bad.

R-e/p: Is there a kind of music that you would like to get into if, for some reason, you couldn't do rock music anymore?
TW: I would say classical. But I'd have to go to school to learn to read and write music. I'm a sucker for Grieg, Brahms and Chopin.

R-e/p: That's pretty schizophrenic — from hard rock to classical.
TM: Well, there is grandeur there. Again, The Who have done a lot of what I would call classically-motivated rock. *Tommy* and *Quadrophenia* have lots of grand classical passages in them, and I really like that. Certain classical composers lean heavily on suspension and certain types of chords or changes. Lots of them write in minor modes all the time, because they are weepy and sad. Grieg is one of those; his best stuff zaps all my emotion, especially the *Peer Gynt Suite*. I think that's the greatest piece of classical music I have ever heard; it destroyed me in the third grade. If the song is great, then you'll be at its mercy. It makes you cry or gives you goose bumps.

R-e/p: As Vice-President of A&R, do you want to make yourself more accessible to people from the outside?
TW: Frankly, I'm more accessible than almost anybody I know. I'll listen to any tape, which is a big pain in the ass. I always felt that it was necessary for me to do it. Unfortunately, I've had to start writing form letters now, which I really hate. I didn't for 10 years, but I've reached an impasse, because anybody can come to see me and give me a tape. The only thing that has changed is that I will tell them: "I hope it's great. Please, if you don't really think it's great, don't bother giving it to me. Our standards are extraordinarily high these days, and it's going to take me a month before I can listen to it anyway." I have always got a backlog. I've never found anything that way, and 90% of my listening time is occupied by tapes that come in the mail. After 10 years I'm beginning to doubt that anything wonderful is going to surface.

R-e/p: Have you been getting many video
. . . continued overleaf —

"In successive albums [with a group], you don't want to be completely schizophrenic in your approach — but, you want to give people something new."

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. . . concert touring? "Seeing the Who play London's Wembley Arena by cable or satellite is fine . . . but, I can't see people passing up the Who at Madison Square Garden just because they have a video cassette of the Who at Wembley."

tapes recently?
TW: There are a couple. I prefer video to audio, because it means I can see the group — what they are playing, how they play, and how they move. The best part is that I'm limited to what they consider their two best songs at the outside, instead of getting a tape with eight songs on it. I'm always cautious about whom I sign, and I also have almost no reservations about signing groups that I like immediately. In other words, if I hesitate, chances are I'm not going to sign them. If I like them, I like them instantly, and it becomes a must-have situation.

R-e/p: According to Billboard, *CBS profits last year were up from $51 million to $72 million. It must obviously pay to be cautious with the people CBS signs, since the story attributed cutting down on the number of people they sign as being one of the reasons for the increased profits.*
TW: Sure, and keeping the successful artists productive and successful; that's just as hard. I think CBS has cut down on the number of artists they've signed — everybody in the music industry has, except for Geffen.

R-e/p: Is CBS cutting back on the amount of studio time per album?
TW: No, we're not cutting back on budgets; we're cutting back in inefficiency, in terms of shorter hours in the studio. Albums are being made more economically now. As far as CBS goes, all their producers usually have to report in at the end of every week. They'll talk with the A&R coordinator of the act about roughly how much has been spent, and how many tracks have been done. They'll discuss it and ask, "Is this guy in trouble? Where is the money? Is the money going up his nose? Is the money going down the toilet?" You have to keep tabs on the people who are spending the company's money, and rightfully so. There was a tremendous amount of waste in the past.

R-e/p: With cutbacks in record company spending which, on the one hand, means less studio hours and, on the other, the artists, producers and everybody involved wanting more state-of-the-art equipment, a studio is caught in the center. Studios are a cash flow business that has to keep investing to get better equipment, but for which there's less work. Do you see a lot of studios closing or going out of business?
TW: No. They're not expanding rapidly, but I've only seen a few studios close. They just come down in their rates and hopefully generate more hours of use — it all averages out. They have to find a way to hang in there during a lean period. Studio use seems to have come back a bit from the end of last year, for instance.

R-e/p: Is CBS going to get into video?
TW: I can't really say. It's not that I'm not allowed to say, I just don't really know. I know that all major record companies have people in charge of video. CBS has definitely made a commitment to video, but I can't tell you what form that commitment is going to take. I don't have any great belief in the strictly musical videodisk as a hot item. In other words, I don't think that people are going to pay another $3 so they can see the group perform. They'll watch it perhaps two or three times and the rest of the time they'll just listen. If they are going to pay the extra dollars, it will be because of the laser technology, and the physical immortality of the record. The fact that a videodisk will last a lifetime would be a wonderful thing, but I don't think that the visual aspect is as important as the longevity aspect.

R-e/p: So when you look for new acts, you're not particularly looking for acts that can work well visually?
TW: It's a plus, but working live visually is different from working on a screen visually; it's a different energy level. You don't disregard it completely. There are certain groups whose music lends itself to the video process, but I still haven't seen where a video cassette has a permanent place in the future of the average music listener's life. How? You certainly can't watch it in your car? You're not going to sit down to listen/watch a whole album more than once, because music is a passive medium. Movies are an active medium, and music is something that enhances any other activity. When you watch something you cannot be disturbed and you can't do anything else; the eyes are captive. A designated picture or visual that goes with the music restricts your enjoyment. It limits your imagination and, to me, does not enhance the process of music appreciation. That is probably a pretty arch conservative view.

R-e/p: With the advent of video is it really going to be necessary or feasible to tour any more, or will videodisks of concerts replace that?
TW: I don't think they will. It will always be necessary to tour, even with the pretty high costs involved. I hope that the costs will all balance out — that we'll be able to achieve the economies of scale in the entertainment business, just as in the rest of the world. Seeing the Bolshoi Ballet on opening night from Red Square, or The Who play London's Wembley Arena by cable or satellite TV is fine. But I can't see people passing up The Who at Madison Square Garden, just because they happen to have a video cassette of The Who at Wembley.

R-e/p: Except that the present generation was raised on quality sounding music, and in many cases you can't get that kind of good sound in a live situation.
TW: No, you can't. But you can't get the energy, the excitement either. That really remains to be seen. We can guess about it all day, but there is a magic. What rock and roll is all about is *involvement*, and being manipulated over the edge. That is what happens at concerts.

R-e/p: Do you see the possibility of small clubs becoming the main venues for promoting groups? People seem to be against spending $12 or $15 to sit on the 50-yard line. Plus the sound is better and more easily controlled in a smaller room.
TW: Much better, but I think the popularity of small clubs is temporary. I don't think it's going to be one or the other; it'll be a shifting mix all the time. Right now it's the small clubs, because there are so many groups around. There are lots of local groups with local followings who will support the band in a small venue. The groups can't get signed, and they can't have huge tours, so they're forced to play small clubs, and to take less money. This is what happens when groups want too much money — the huge dates become prohibitively expensive to promote.

R-e/p: There are artists like Kenny Loggins, Beach Boys and Melissa Manchester, who play Vegas regularly now.
TW: I think that's a good idea. The Vegas thing itself would have to change dramatically, I can't see the entire Woodstock generation trecking off to Vegas.

R-e/p: Sure, but for most of the people in the United States, this is an unusual situation. Not everybody lives in New York or Los Angeles where the groups themselves live. For the bulk of the people, to see their favorite rock group Vegas would be a perfect opportunity for them. Eventually, we'll see Ted Nugent at the Alladin . . .
TW: Or The Who at the MGM Grand. Absolutely. For big groups that would be great . . . or even smaller groups. I suppose you could put Police and The Pretenders in one place, and pack it for weeks. Good idea! Let's do it!

Actually, it's all very provocative, but it's difficult right now to figure out the future of video or live music, because the economy is in such a horrible state of flux. People are getting very demanding. It's going to take more and more to entertain people adequately as time goes by. □□□

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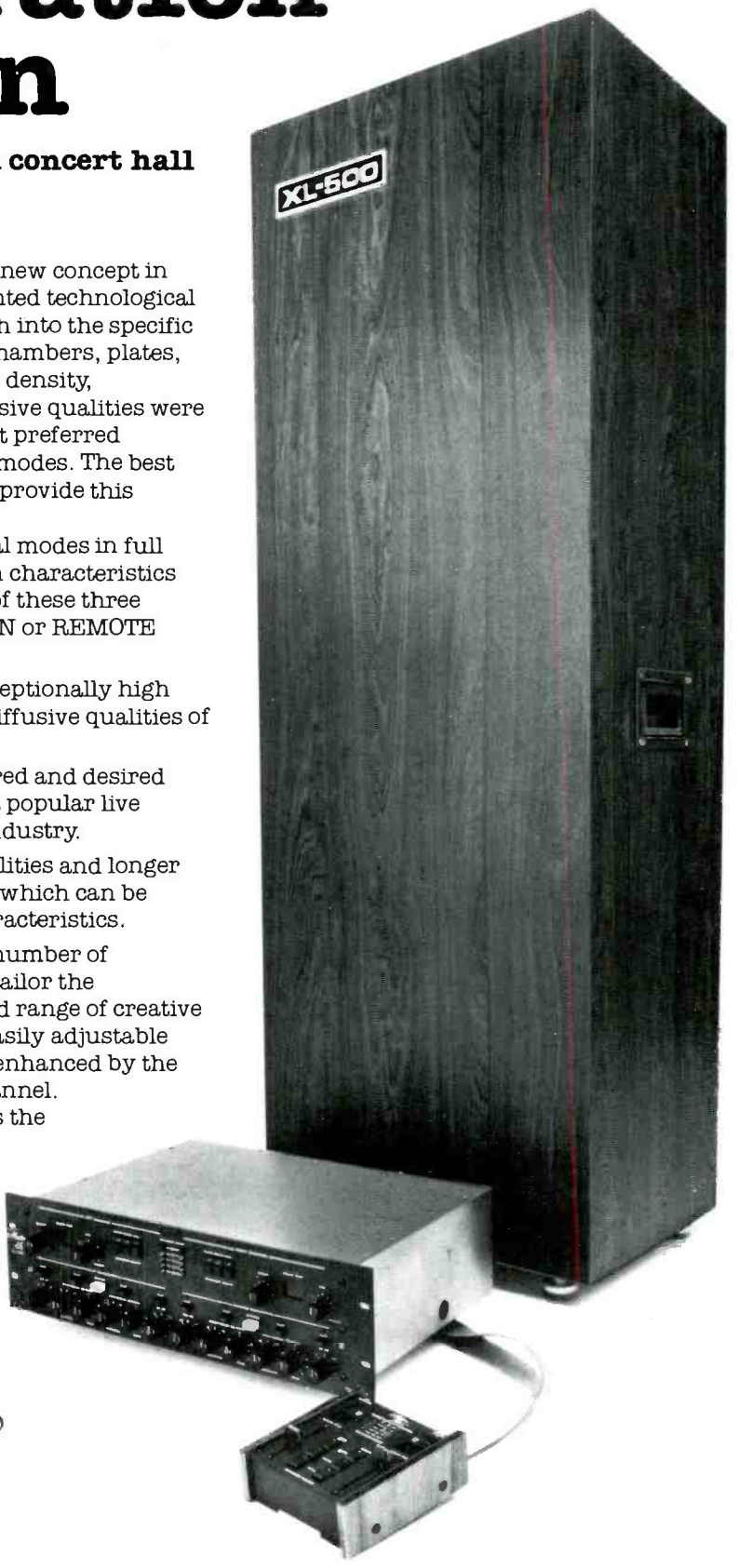

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The S0112T speaker system utilizes two woofers (a 12" Yamaha JA3061 and a 10" JA2507) and four 2" Yamaha JA0554 tweeters in a portable bass reflex cabinet.

The S0110T utilizes a 10" Yamaha JA2511 woofer and a JA0556 tweeter in a heavy-duty ported enclosure offering high sensitivity and very compact size.

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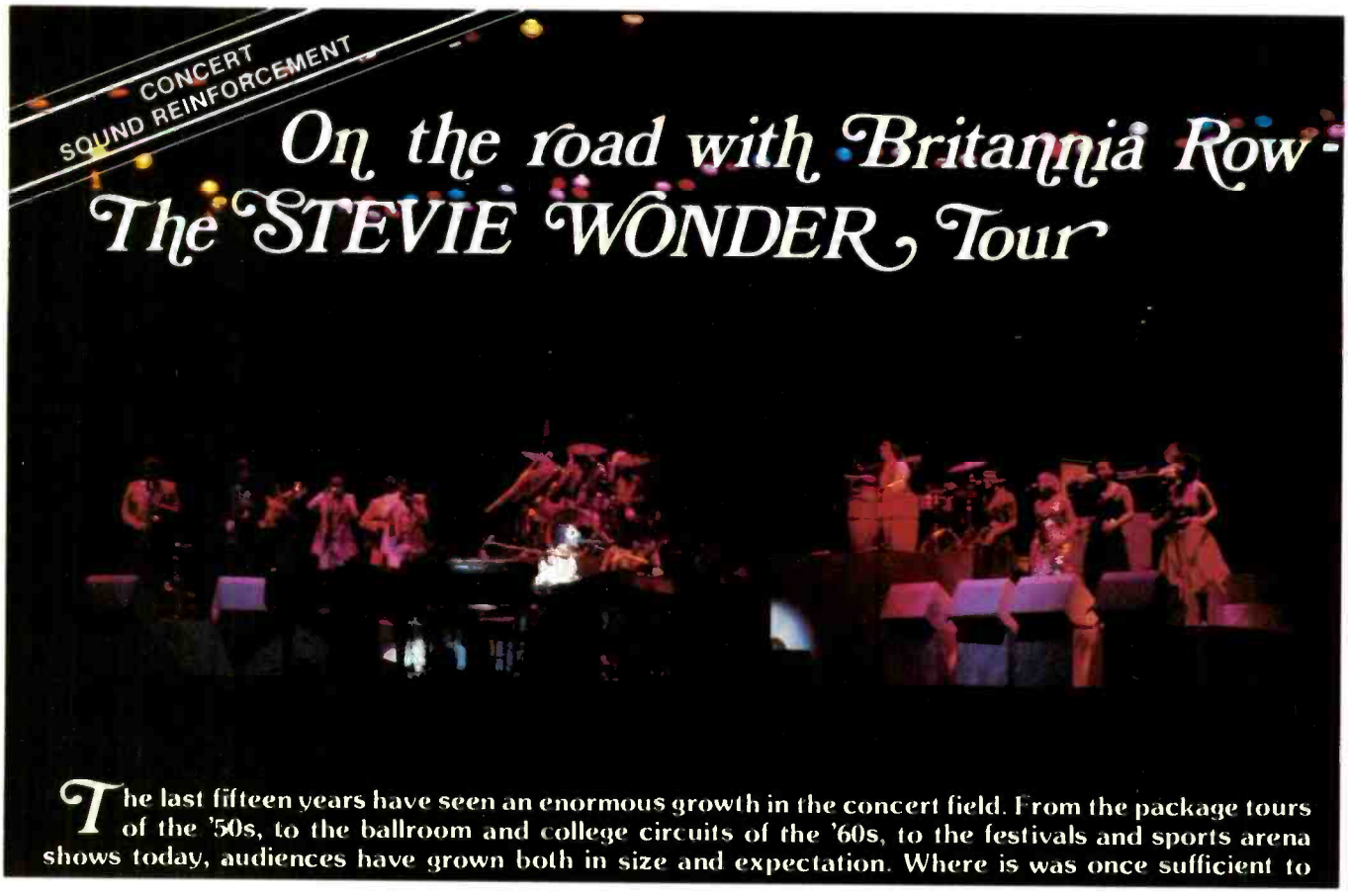
CONCERT SOUND REINFORCEMENT

On the road with Britannia Row - The STEVIE WONDER Tour



The last fifteen years have seen an enormous growth in the concert field. From the package tours of the '50s, to the ballroom and college circuits of the '60s, to the festivals and sports arena shows today, audiences have grown both in size and expectation. Where is was once sufficient to

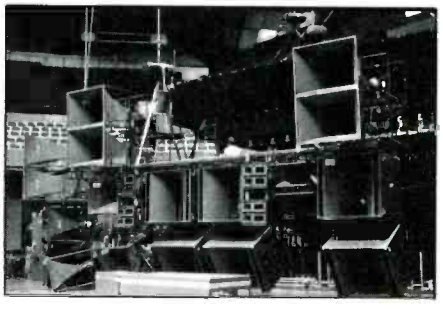
perform three songs in front of a pick-up band, the modern group or artist is expected to reproduce their hits accurately, while presenting a visual spectacle exciting enough to communicate over hundreds of feet. This has led to the creation of many new jobs, and the success of most modern concert events depends on these specialists.

Early in their career Pink Floyd secured the services of a man with the highly suitable name of P. A. Watts; it was Peter who helped the band to establish its reputation for professionalism and quality sound. Pink Floyd chose to spend a large proportion of their earnings on equipment, and demanded high standards of performance from both the gear and the road crew. Promoters were quick to recognize the advantages of renting from the band; several even went as far as including the legend "Sound by Pink Floyd" on their concert advertising, confident of the approval of fans and musicians alike.

Commercial success was still some way off, but film scores, festivals and experimentation with quadraphonic sound gave the band and crew invaluable experience in choosing and operating sound systems. A policy of touring with their own PA rig, regardless of cost, made American tours a financial burden, and the band was never very enamoured of the touring life. By 1972, however, Pink Floyd had finally broken even on an expensive U.S. tour, and were able to instruct their manager not to accept any series of engagements of over three-weeks duration.

With the success of *Dark Side of the Moon*, and a new record contract to fulfill, the group toured less frequently and with increasingly complex productions. Several companies were formed to rent out the now enormous amount of equipment the band had amassed, including Britannia Row Audio, Britannia Row Lighting, Britro, Inc., and Britro West, which now have offices in London, New York and Los Angeles. In the fall of 1979, as Pink Floyd prepared its most ambitious production to date, *The Wall*, Britannia Row Productions was formed. This new company, under the direction of Bryan Grant, now offers a full service touring package, including set design, lighting and sound systems.

Speaker array loaded on grid ready to be flown in front of stage.



One of the first clients for the new organization was Stevie Wonder, who was due to play the Empire Pool, Wembley, North London, one of the few halls in England that is comparable in size to a U.S. sports arena. The shows proved to be a great success, and Britannia Row were asked to do the upcoming U.S. tour which, after a break over the Christmas holiday season, resumed in January of this year. I caught the final pre-Christmas show in Seattle, Washington, and during the load-in and set-up talked to Bryan

the author —

Chris Michie *began his career in 1969 as a tape-op in Denmark Street, London's Tin Pan Alley. Later, as an engineer at AIR Studios he recorded sessions for* Talking Book, *by Stevie Wonder, and assisted Pink Floyd on their* Meddle *album, which the band had brought to AIR because of E.M.I. Abbey Road's reported reluctance to 'go sixteen.'*

In 1972, on the eve of the London debut of the Dark Side of the Moon *show, Pink Floyd's sound-mixer was hospitalized after rear-ending a Rolls-Royce. A temporary replacement was quickly sought — Glyn Johns and Chris Thomas reportedly passed on the gig — and by the following evening Chris Michie was grappling with the mysteries of feedback and quadraphonic sound. A week later he recorded the* Obscured by Clouds *album in Paris, and during the following year toured Japan, the U.S. and Europe as the group's sound mixer.*

After stints with Jethro Tull, Roxy Music and Blondie, Chris moved to San Francisco where he now consults for McCune Sound, and teaches a course in Sound Reinforcement at the College for Recording Arts. His most memorable moments include "not getting any complaints at Carnegie Hall;" and being told by Tom Petty's manager and record producer to "Turn up the PA until it distorts."

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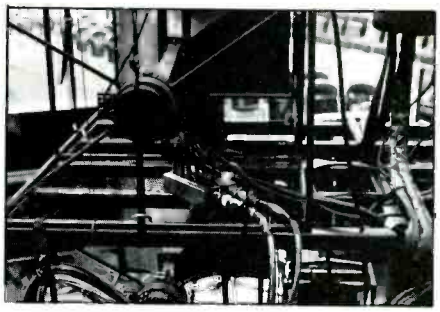
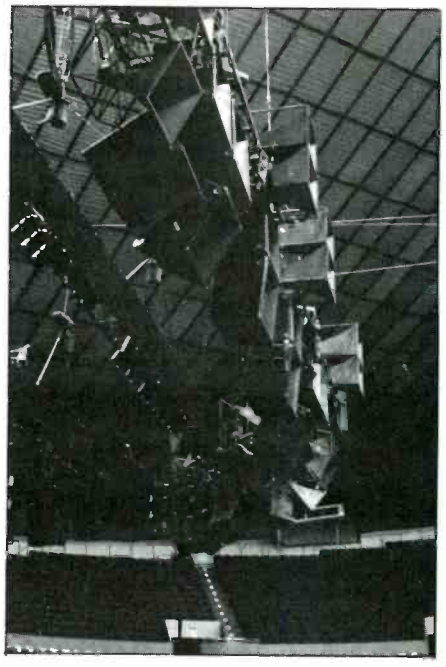
Rear view of Altec horn clusters, showing flexible mount for the Mantaray MR94-8 units.



Speaker-level multicore cables mounted beside the mid-range horns.



Flown front-of-house loudspeaker system in position above the front of the stage

Grant. Why the name Britannia Row Productions, I asked?

"We had such a diverse amount of equipment and talent," Bryan offered, "including set designers, lighting and sound, that it made better sense, and gave us more control over our situation to offer all those services together as a package.

"Stevie Wonder came to us having seen the Floyd shows in Los Angeles, and we did a week in Wembley last September. We designed a set for them, a sort of hillside with the set in the middle of it. We used the Altec system, which he liked, and just brought the whole thing over here for this tour — except the lights, which came from our New York shop."

The Britannia Row PA system used on the Stevie Wonder tour is the result of a joint venture between Stan Miller of Stanal Sound and Altec-Lansing, now being marketed under the collective brand name "Stanley Screamers." Stan Miller describes the rig as a three-way system with sub-woofers and, like every Stanal system, is designed to be hung or flown above the stage area. In order to increase Critical Distance in reverberant environments (i.e. most arenas), Stanal Sound has opted for high 'Q' devices throughout. Also, Altec Mantaray® horns are used for the mid-range, rather than the more usual 12-inch speakers favored by other companies. Rather surprisingly, in view of the current interest in phase coherence and time-alignment, the various components are spread out on four separate grids. I asked Bryan Grant why there had been no attempt to simulate a single sound source.

"That's what's interesting about the whole system," he offered. "When I first saw the rig, it took me about 10 minutes to actually locate the system; once it's up in the air it just looks like part of the ironware in a coliseum roof. It may be a very diseparate array of components, but it does work. You get an *even* sound. The speakers are carefully focused before they go up. In the arena situation it doesn't actually change that much — it's easier touring America than in Europe. The venues there are all dramatically different from one another."

Front-Of-House Loudspeaker Array

The concert-sound system is assembled and flown under the supervision of Tim Charles, who has a wealth of experience in U.S. arenas, gained from touring with Bob Dylan and Neil Diamond while working with Stanal Sound. At the Coliseum in Seattle the rigging was more than usually complicated by the roof design, which is supported by only two trusses. These run the length and breadth of the hall, meeting at right angles above the center. Since 17 hanging points are necessary for the two lighting trusses, four PA grids and their associated cables, most of them had to be made by using extremely long bridles running half the length of the hall. The finished rig looked quite dramatic, but delayed the set-up by nearly an hour.

"We have pre-rigged a few of the more difficult halls," Bryan Grant explained, "but generally Jade Dearling, the rigger, comes in at 8 a.m., and works with the house riggers. The lighting people come in at 10 a.m., the sound people at 11, and the band's gear at 1 p.m. Today's is an incredibly complex rig, but

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(Both channels driven)
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(In Bridge Mode)
INTERMODULATION DISTORTION:
Less than 0.1% from 40 mW to 400 watts RMS into 4 ohms. Typically below .05%
TOTAL HARMONIC DISTORTION:
Less than 0.1% from 40 mW to 400 watts RMS, 20 Hz to 20 KHz into 4 ohms. Typically below .04%

CS-400

FREQUENCY RESPONSE:
+0, -1.0 dB, 5 Hz to 40 KHz
RATED POWER:
200 watts RMS per channel into 4 ohms
(Both channels driven)
400 watts RMS into 8 ohms
(In Bridge Mode)
INTERMODULATION DISTORTION:
Less than 0.1% from 20 mW to 200 watts RMS into 4 ohms. Typically below .05%
TOTAL HARMONIC DISTORTION:
Less than 0.1% from 20 mW to 200 watts RMS, 20 Hz to 20 KHz into 4 ohms. Typically below .04%

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it's still going up smoothly and efficiently — we're generally in and up in about four hours, and out in between 2 and 2½ hours. We have run into overtime on a couple of occasions, but only because the audience wouldn't let Stevie off the stage!"

Flying the system is quite straightforward: four long "grids" like metal duckboards are hung on Spansets from eight chain hoists, the grids being arranged so that two of them face forward, and two are directed at the audience to the sides of the arena. The stage set is designed to look good from all angles; when seats behind the stage are sold speakers can be aimed backstage from the side grids. However, this is more easily done with horns than with bass cabinets. Unless some additional speakers are flown, the backstage sound lacks bass. This was the case at the Seattle Coliseum.

Grids are constructed of 2-inch tubular steel, and measure 18 by 4 feet. The exact disposition of the various components depends on the environment, SPL requirements, and type of sound desired. Britannia Row uses more horns than Stanal and, in the case of the bass bins, have substituted a different driver from that originally supplied. As can be seen from Figure 1, a typical rig is made up of four long-throw Mantaray horns mounted in pairs on the upper surface of the grid. The upper unit of each pair handles frequencies above 6 kHz, and is fitted with an Altec 288-16 G driver. The lower Altec MR42 is designated a mid-range horn, and has a 291-16 B driver that covers the frequency range down to 800 Hz.

Below the grid a pair of Altec MR 64 short-throw horns are similarly arranged with respect to position and drivers. High-frequency tweeters are Altec MR902-16HF horn/driver combinations fitted with Tangerine phase plugs, and are mounted in clusters of four. The third type of mid-range horn is an Altec MR94-8, again with a 291-16B driver. A flexible ladder-like frame holds four of these in a vertical line. By pulling back and up on the bottom of the frame, the four horns are made to describe an arc, widening the vertical angle of dispersion.

Similarly, the bass bins are joined in pairs by a hinge arrangement that allows the lower of the two cabinets to point down, while the upper faces forward. Named the SS 1120R, this horn-loaded twin 15-inch bass bin covers the range below 800 Hz, and is usually fitted with Altec 421-8LF drivers. Britannia Row has replaced these with Gauss 5480 units, and Stanal is planning to use the 921 driver in the future for bass applications. The cabinet may also be used with a coaxial driver, such as the Altec 604-HPLN (or 604-168X, as it is now known). This arrangement has the advantage of being two thirds of a tri-amp system, an Altec Mantaray being the obvious choice for the mid-range component.

Securing components to the grid is accomplished with Aeroquip straps. By adjusting their lengths the system can be focused quickly and accurately. A heavy multicore cable carries the speaker-level signals from the amps below, all connections being via XLRs. Checking the components is the responsibility of Gerry Fradley and Colin Lyon — once they are satisfied that all is in

. . . continued on page 54

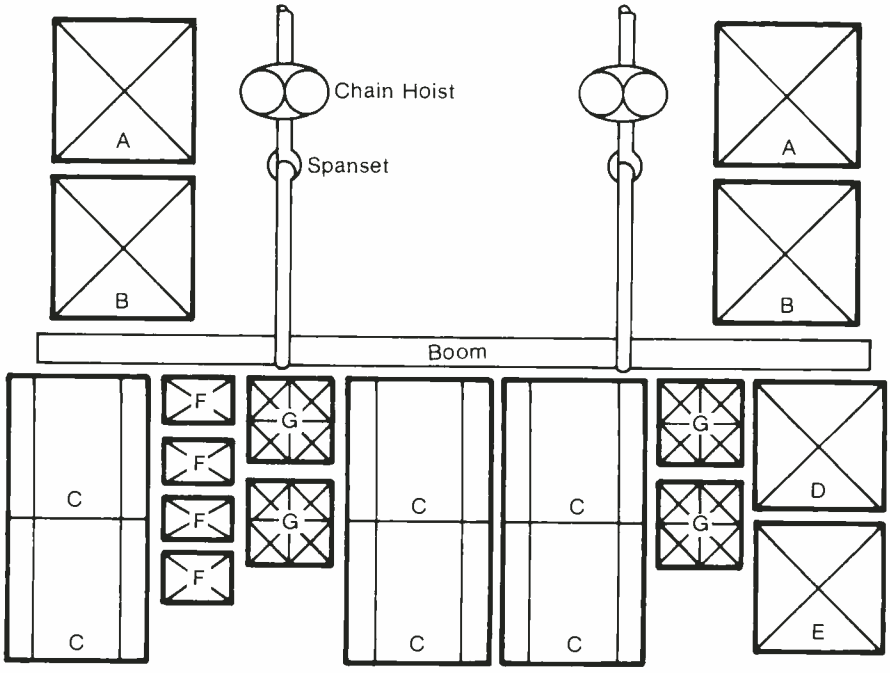

Figure 1: A typical speaker layout for stage-left front. The lower speaker cabinets are angled downwards at the center and front sections of the audience, lower horn cabinets being angled to the sides. Sub-woofers remain on the arena floor.
Cabinets 'A': High-frequency long-throw units, containing MR42 horns on 288-16G drivers.
Cabinets 'B': Medium-frequency long-throw units, containing MR42 horns on 291-16B drivers.
Cabinets 'C': Stanley Screamer SS1120R bass units, containing a pair of Gauss 5480 drivers.
Cabinets 'D': High-Frequency short-throw units containing Altec MR64 horns on 288-16G drivers.
Cabinets 'E': Medium-frequency short-throw units containing MR64 horns on 291-16B drivers.
Cabinets 'F': Mid-frequency units, containing MR94-8 horns on 291-16B drivers.
Cabinets 'G': High-frequency tweeter clusters, containing four MR902-16HF horn/driver combinations, with Tangerine phase plug.

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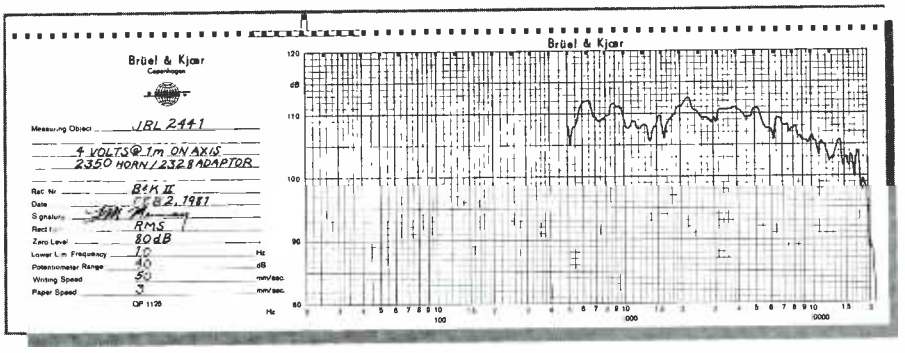
This is not the only reason to buy JBL's new 2441 compression driver.



Unequalized frequency response of a typical 2441 on a JBL 2350 horn.

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

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

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

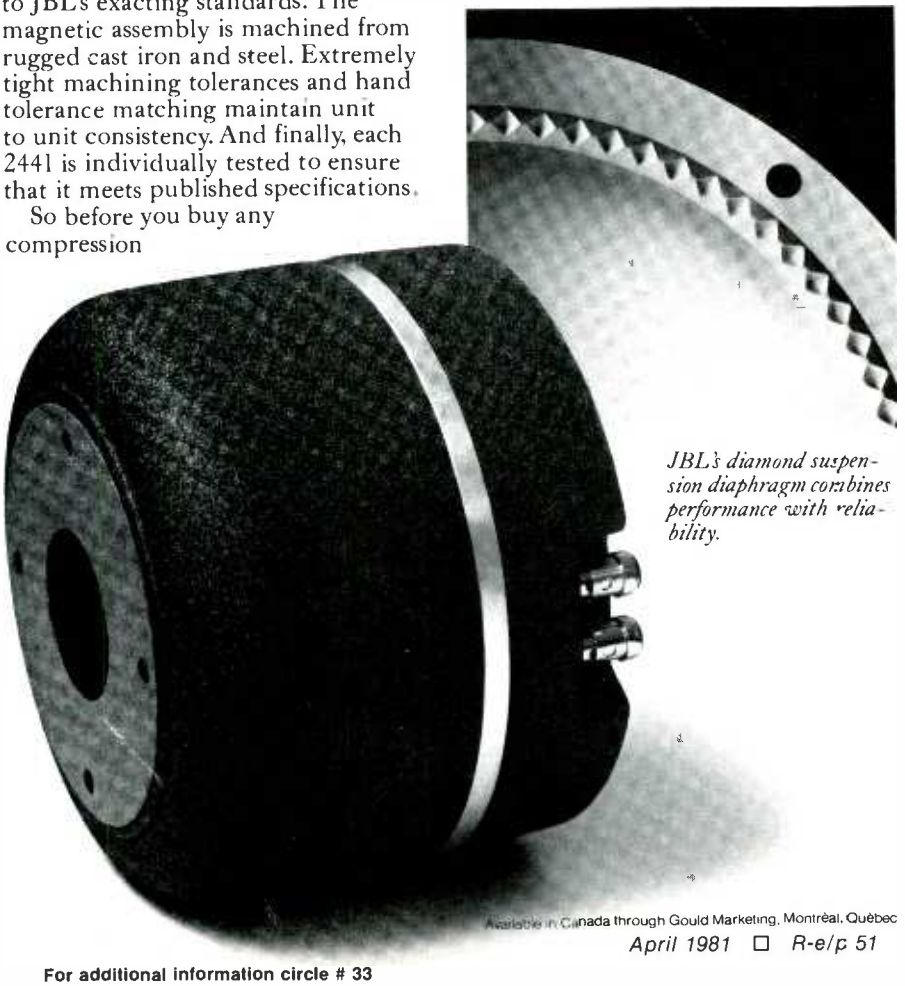
So before you buy any compression driver, ask your JBL professional products dealer about the 2441. It'll deliver a lot more than just an impressive frequency response.

1. Patent Applied For

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

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

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



JBL's diamond suspension diaphragm combines performance with reliability.

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Have you heard the board

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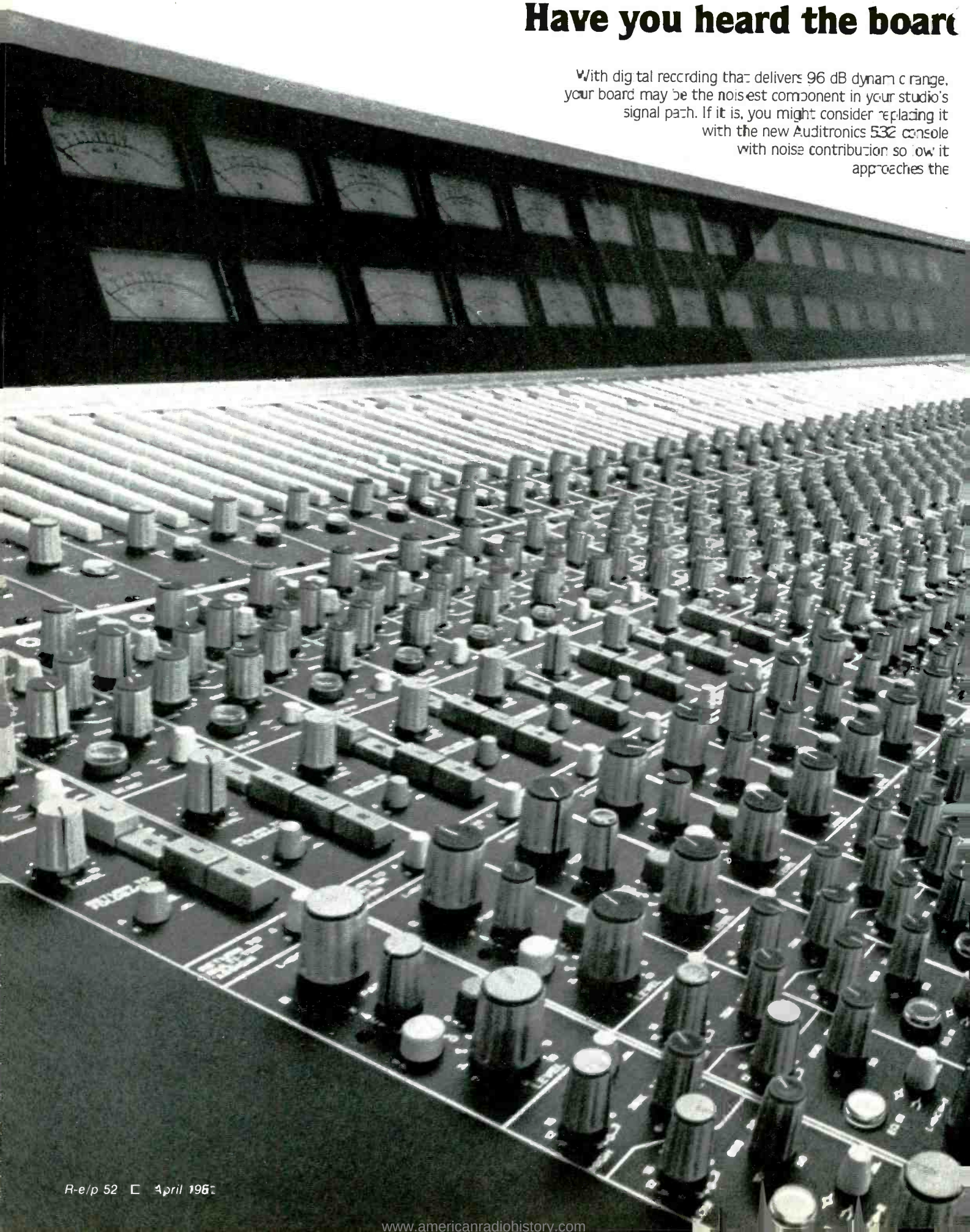

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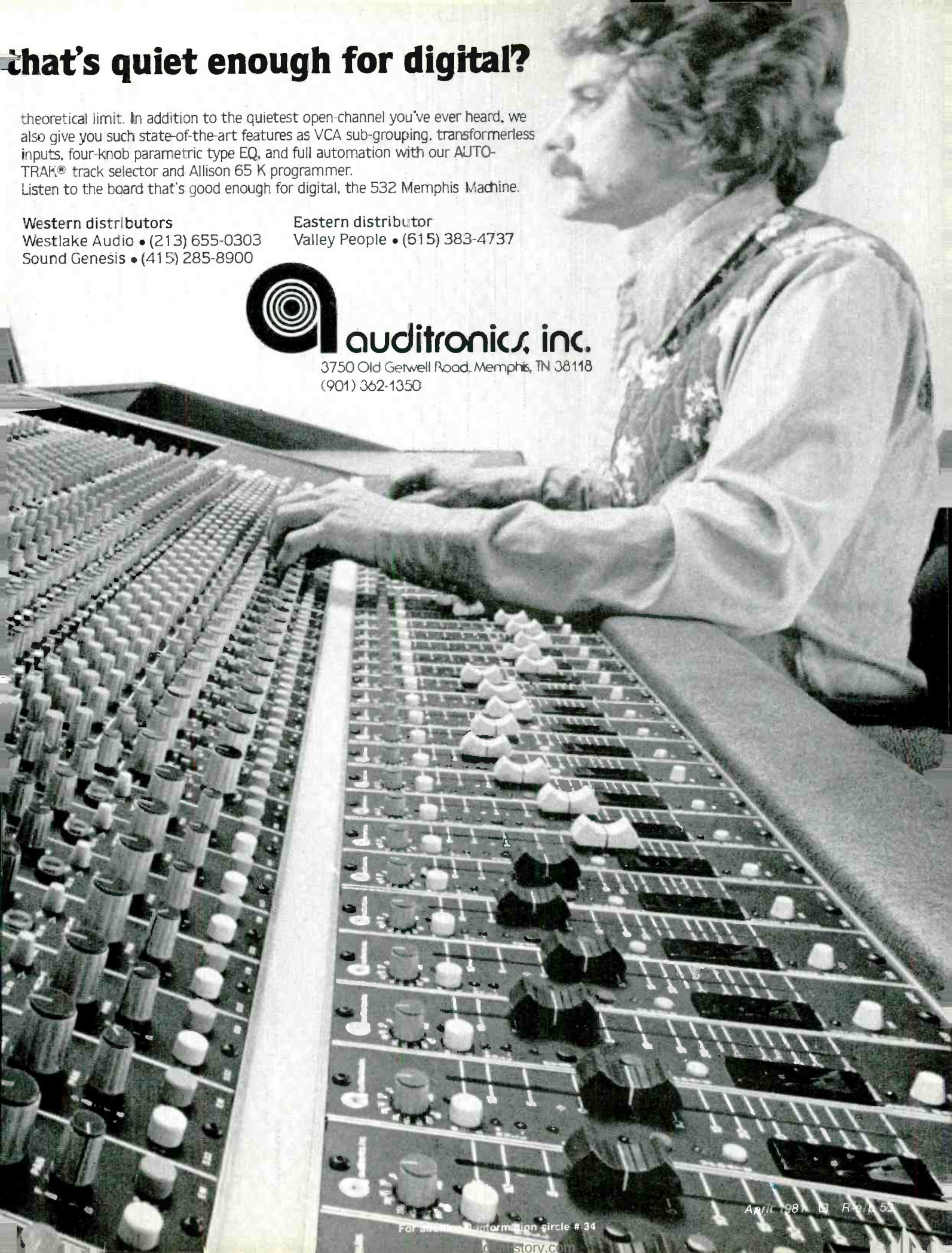

For information circle # 34

order the grids are hoisted aloft. Tim Charles has found in the past that raising the side grids higher than the front grids improves the bass response of the system. This proved impossible in the Seattle Coliseum, however, because of the low hanging points.

With the main PA out of the way, the sub-woofer stacks are assembled. The basic unit is an SS 1020R twin 15-inch cabinet containing Altec 421-8LF drivers, and is designed to supplement the bass between 20 and 80 Hz. With 12 of these units at his disposal, Tim Charles was inclined to arrange them in an arc either side of the stage below the grids. However, the Fire Marshall had other ideas, and they were made up instead as straight walls three units wide and two high.

Behind this rather imposing facade stand the amplifier racks, which are of two types. Sub-woofers are driven by Altec 9440As, and everything else by Phase Linears. These have been been modified by Britannia Row to better withstand the rigors of touring, and now bear the legend Pink Floyd Phase III. (Some of these amplifiers were once components of previous Pink Floyd concert-sound systems, and one or two might have gone on the Japanese tour of '72 for which a stretched DC-8 was chartered to transport band, crew and gear from England. On take-off the passengers had to sit in the back of the plane to balance the PA and band gear loaded in the front. Upon arrival at Tokyo the gear was treated as merely unusual baggage, with the result that by the time the band had cleared customs, horns, amps and bins were gracefully spinning on the baggage carousels — much to the amazement of the local Skycaps.)

EQUIPMENT LIST
MONITORS

Stage Left — Arnie Toshner

Two Midas 24/10 monitor mixers, fitted with PRO4 and PRO2 modules.

Four Court Acoustics third-octave graphic equalizers.

Rebis stereo parametric equalizers.

AMS DMX-15-80 digital delay unit/pitch shifter.

Britannia Row custom crossovers.

Additional Midas monitor mixer for support act.

Stage right — Steve Bator

Midas 24/8 monitor mixer.

10-channel Midas side panel.

Two Klark-Teknik third-octave graphic equalizers.

Court Acoustics third-octave graphic equalizer.

Yamaha crossovers.

Two dbx Model 155 compressor-limiters (bass and kick drum mixes).

Monitor cabinets and amplifiers

Monitor cabinets are Martin Audio and Court Acoustics wedges, supplemented by Altec Stanley Screamer full-range (tri-amped) cabinets for bass, drums and keyboards. These SS 3210 cabinets contain a pair of 604 HPLNs, plus a 291-16B driver mounted on an MR 94-8 horn; crossover points are at 800 Hz and 6 kHz. Amplifiers are Phase Linear 400 and 700 models, some in the guise of Pink Floyd Phase IIIs.

Mixing Console

Bryan Grant freely admits that in former days his opinion of PA systems was entirely partisan.

"Those were the days when each company had one type of system," he recalls, "and that was the *best* system in the world; no-one else's system came anywhere near it. Nowadays you can get a good sound out of most of the more sophisticated systems. If you're sending a clean signal, the difference between the major speaker systems is almost a matter of taste. It's what you put into them from the console that makes the difference. We now have three types of system: The Court, which has JBL components; The Martin, which uses Gauss/JBL components; and The Altec. We feel that this covers the different tastes of various bands that use Britannia Row Productions."

In order to ensure that the right ingredients go into the mix, David Kirkwood has been taken on to supervise activities at the mixing console. To handle the 55 mike and instrument inputs, David and his assistant, Colin Lyon, each have a 32/8 Midas console. Colin mixes mainly rhythm instruments, while David features soloists and controls overall levels. The console outputs are passed through Court Acoustics third-octave graphic equalizers, and thence to a Brooke Siren Systems crossover. Not surprisingly, only bass instruments are fed to the sub-woofers from an auxiliary bus output. After a dbx Model 162 stereo compressor-limiter, these signals pass through a pair of SS5000 band-pass filters, which roll off frequencies outside the 20 to 80 Hz range at a rate of 18 dB per octave.

Outboard signal-processing equipment is comprehensive. Pride of place goes to Stevie Wonder's EMT 250 digital reverb unit, and a Sony PCM unit used to decode a backing tape during "Happy Birthday," one of the sings from the *Hotter Than July* album. A Publison DHM 89B2 Stereo Digital Audio Computer and an AMS DMX-15-80 DDL provide additional delay and reverb options, while a rack of eight APSI Model 562 parametrics is available when more extreme equalization is required. An ADR Scamp rack contains five S01 compressor-limiters and seven F300 gate/expanders, for use on the bass, synthesizer and drums. Also available are three UREI 1176 compressor-limiters, one of which was used on Stevie's voice earlier in the tour. When necessary, overall limiting of the system is accomplished in the BSS crossover.

Monitor System

Despite the presence of all of this high technology, the PA system could not be described as revolutionary in concept. By contrast, the monitor system is probably one of the most complex currently on tour. Stevie Wonder wanted to dispense with having instrument amplifiers located onstage, and his musicians were presumably agreeable — not so much as a Fender Champ disturbs the elegant lines of the set. This is a mixed blessing for the sound crew. On the one hand, monitors do not have to fight the sound from the band's equipment, as is so often the case. But, on the other hand, the stage monitors must provide a comprehensive mix

Midas 32-in/8-out mixing consoles, and lighting control desk.

to all 15 musicians in the band, some of whom are totally dependent on the monitor mixer for the sound of their own instruments.

In order to satisfy both these requirements monitor speakers are provided at no less than 26 locations, including two Stanley Screamer full-range cabinets hanging from the lighting truss. Responsibility for the monitor mixing is split between two monitor mix engineers using four mixing boards. Arnie Toshner handles Stevie Wonder's monitors, and those of the singers, percussionist and second keyboard player. On the opposite side of the stage Steve Bater mixes for the brass, guitarists, drummer and bassist. Each monitor mixer provides cross-stage submixes for the other, and Arnie Toshner has an additional feed from snare and kick drums direct from the microphone.

Stage Layout

With 15 musicians, seven keyboards, drums, percussion and 24 monitor cabinets on stage, Britannia Row's set designers had quite a challenge before them. It is testament to their expertise that the completed stage used by Stevie Wonder was attractive but not distracting, and functional yet intimate, offering the audience a clear view from any angle. The risers are of a modular construction, which makes adjustments relatively easy, as Bryan Grant explains:

"We have had to leave a couple of pieces off the set on occasions when the stage was not large enough. We have our own stages — Graeme Fleming [Britannia Row Lighting] has three 60 x 40 stages, plus various roofs for outside work. But in this case our requirements are very simple, so to travel a stage doesn't make economic sense, especially when we're only doing three or four gigs a week."

In Seattle the Coliseum stage was the desired 60 by 40 feet, and once the lighting trusses were flown, the set took very little time to construct (Figure 2). Stevie Wonder's four instruments (not counting harmonica) are arranged as three sides of a square, located downstage center. A grand piano is

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The Dual Limiter is also a forgiving limiter. Attack and release characteristics dictated by the front panel controls are modified by program dynamics and compression requirements. The slope increases smoothly past the threshold point, allowing a *gradual* transition into compression. Varying the Dual Limiter's threshold region produces a variety of intermediate slopes with the primary slope being that chosen by the slope switch. These features permit apparent dynamics to be maintained even though the dynamic range is being controllably limited.

The Dual Limiter's remarkable versatility is based on the fact that it can be viewed as two independent mono limiters that can be patched together via front panel switches for stereo limiting applications. Each channel has an In/Out switch, Slope switch, Input, Output, Attack and Release controls and an LED display, showing the amount of gain reduction. On the rear are both XLR and ¼" phone jack (ring-tipped sleeve) input and output connectors. Each channel's detector is accessible via rear panel phone jacks to permit external tailoring of the detectors' frequency response. This feature allows for de-essing (reduction of vocal sibilance) and a wide variety of frequency dependent limiting needs.

Because virtually every form of musical signal was used to evaluate the Dual Limiter's response during the initial stages of development, its sophisticated internal circuitry enables it to sound musically *natural* — even at extreme compression settings.

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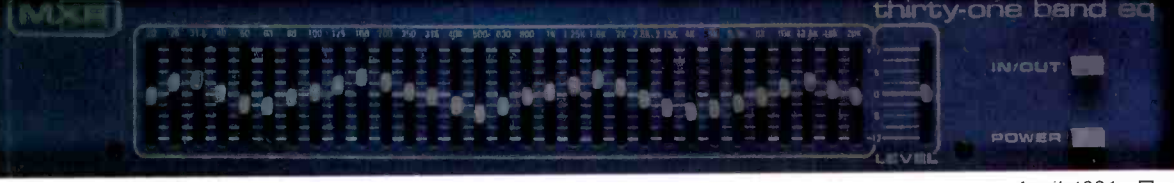

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to the audience's left, a Fender Rhodes with a Clavinet on top faces them, and a Yamaha CS-80 polyphonic synthesizer faces stage left. The 14 members of Wonderlove are on risers faced with a marble-like veneer. The horn players and backing singers have individual monitor speakers on mini-risers in front of them, but otherwise the set is very uncluttered and all the musicians are clearly visible to each other and the audience.

Stage right are located two saxophone players and two trumpet players, one of whom also plays one of the three hi-hat cymbals on stage. Behind and above them on a second tier are two guitarists surrounded by a large array of effects pedals. To their left and slightly above sits the drummer, and to his left — across a center stage aisle dividing their two risers — is the percussionist, player of the third hi-hat, and much else besides. On the remaining riser a second keyboardist occupies the upper level with the same instrument set-up as Stevie Wonder (less the grand piano), and the four female vocalists mirror the horn players position stage right.

Concluding our backward journey through the audio chain, we arrive at the microphones. Stevie Wonder uses three Shure SM-57s for vocals, one at each of his keyboard positions. He also has two Nasty Cordless wireless mikes that are used at the end of the show in a duet with Gil Scott-Heron. SM-57s are also used for the four female vocalists and the two trumpets, saxes being miked with a Beyer M88 and a Sennheiser 441. Sennheiser 421s are used on kick drum and floor toms. Rack toms, guitar vocals and most percussion instruments are covered by SM-58s, AKG C451s being used as overhead mikes for the drum kit, hi-hat and bells, plus a solitary Beyer 201 for the timbales. The piano is also miked, but only as backup for a Helpinstill pickup that provides the main signal for both PA and monitors — an arrangement which, to my ears at least, proved unsatisfactory.

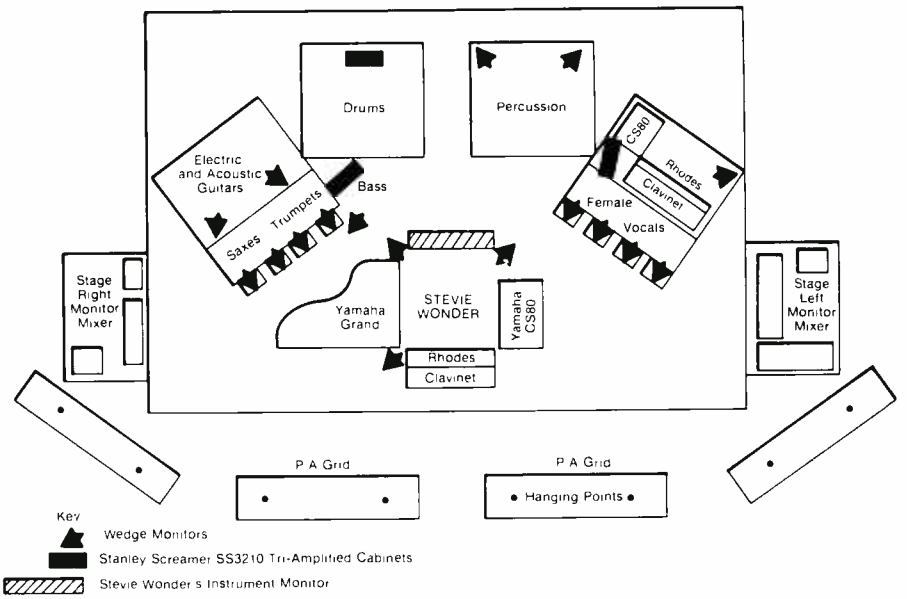

Figure 2: Non-scale stage plan for Stevie Wonder Tour. The total stage area measures approximately 60 by 40 feet. Each loudspeaker cluster flown in front of the stage is suspended from 2-inch thick grids measuring 18 by 4 feet. The pair of SS3210 monitor cabinets hanging from the lighting truss have been omitted for the sake of clarity.

Touring in the United States

With the PA rigged and the stage set I took the opportunity to ask Bryan Grant about the Stevie Wonder tour. I mentioned that, in the past, some British road crews had been extremely abrasive, making concert promotion in union houses difficult.

"Yes. Very much so," he agreed. "We've fortunately got on very well with the union crews. Even when we've been in confused situations, they've been very flexible with us. I almost picked our crew as much for their characters as for their technical abilitites. And since everyone in the crew is working for the same company, you don't come across those situations where the lighting company is in conflict with the sound company, or vice versa — everyone knows they're all working toward the same end. Most of these guys have been on the road for a long time and if there is a problem everyone gets together and sorts it out."

As an aside, perhaps the most surprising problem of the tour was caused in Greensboro, North Carolina, by the non-arrival of the truck containing the chain hoists. The driver had been arrested, so while the remaining three semis were unloaded and their contents assembled as far as possible, Bryan Grant and another driver chartered a plane to the scene of the arrest. There they reclaimed the truck and managed to deliver it to the gig in time for the show to start on schedule!

"A lot of that nastiness and arrogance that we were talking about," Bryan Grant continued, "was because of insecurity. If you don't really know what you're doing you tend to get a lot more uptight, and you get frustrated because you can't see a solution to your problems; you start screaming and shouting — I used to do that when I first came over here 10 years ago. But I soon learned that I was achieving nothing that way."

Had Bryan Grant been impressed with the sound of their competitors at any recent rock shows, I asked?

"At the time, yes. Again we come back to the point that if the equipment is sophisticated enough, in the end it depends on your engineer, and how well the guy can use the hardware at his disposal.

"Effects are extremely important in a live show," he feels. "We have a large amount of outboard gear and if an engineer knows what he's doing, he can totally turn a system around. For example, on a number of occasions Dave Lord [Peter Gabriel's engineer] has made one of our older systems sound better than anything I've ever heard."

Bryan Grant is particularly optimistic about the future of the concert sound market. "If you do one type of act well," he says, "then other acts of that type will go to you, because they want to reproduce that type of sound. One of the things I've always been curious about in this country is the immense amount of research into speaker systems. Every year someone comes up with something new, be it a Time-Aligned™ system or a full-range cabinet, but the mixing end always seems relatively *primitive*. They're still using cheap mixers — companies like Midas are only just beginning to take off here."

It's worth mentioning that although Britannia Row are an appointed dealer for Stanley Screamers, the company has no connection with Midas — other than as one of its more demanding, and regular, customers.

Having spent an afternoon as a clinical observer, I was now looking forward with keen interest to that evening's show. Unfortunately, the opening set by Gil Scott-Heron and the Midnight Band was marred by some noticeable distortion in the mid-range. For a moment I experienced that sinking feeling so familiar to concert-goers who realize that the long anticipated appearance by their favorite artist may well turn out to be a bummer. However, whether it was a gain-staging problem or a poor choice of vocal microphone, the distortion made no further appearance.

Stevie Wonder's set at the Seattle Coliseum was one of the best concert events I have ever witnessed. Since, as a guest I had no assigned seat, besides checking levels around the perimeter I sat in several late-comers' seats in different parts of the hall. In every seat the coverage was excellent, the mix superb, and the dynamics exciting. Peaks of 110 dB SPL during such numbers as "Higher Ground" contrasted with levels in the low-70s for ballads. At no time were one's senses assaulted, but the very physical effect of the sub-woofers combined with the skillful pacing of the show made it hard to stay in one's seat. In fact, a large portion of the audience spent the concert standing in their seats or bobbing in the aisles.

Near the end of a show lasting over two hours Stevie Wonder asked the audience to recognize the contribution of the production crew. The response was deafening applause that seemed to last for several minutes; I think that the crew had every right to be pleased with themselves. Installing and operating sound systems is demanding work, and to be successful a company must have not only top-grade and reliable equipment, but also experienced and professional personnel — plus a modicum of luck. It would appear that Britannia Row Productions has them all. □□□

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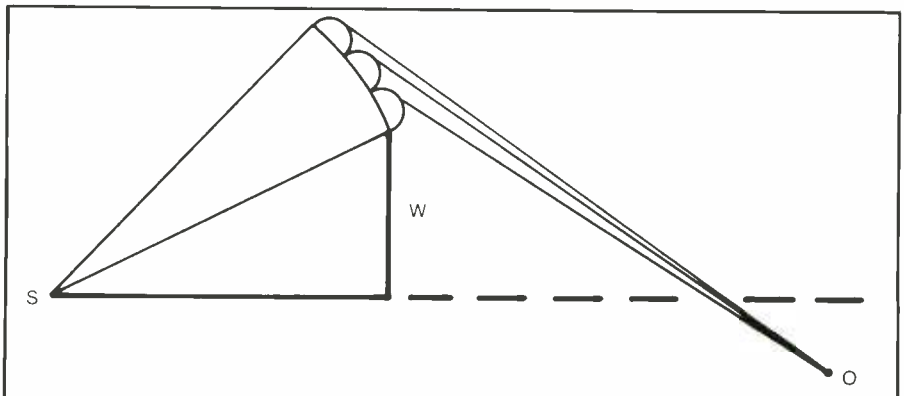

Figure 1: Graphic construction of diffraction effect when a sound is radiated across a sound-opaque wall

It seems that nature not only abhors a vacuum, but also straight lines. Light is bent everywhere, even in interstellar space by the gravitational attraction of stars and planets, and sound rays in the open and in a room are forever diffracted and scattered around objects such as trees, furniture, and people. One might even say that rectilinear propagation of light and sound is the exception, and that diffraction is the normal course of wave transmission.

The word "diffract" derives from the Latin *diffringere*, meaning to break into pieces. The bending of light and sound, both transmitted by longitudinal waves, is a form of interference; the in-and-out-of-phase condition when a travelling wave packet or hypothetical ray meets another. A simple graphical explanation of this phenomenon is offered in Figure 1. A source of sound, S, is radiating a signal over a wall, W, on the other side of which is stationed an observer, O. By Huygen's Principle, all points on a wavefront can be considered as point sources for the production of spherical secondary wavelets. The rays drawn from the secondary wavefronts arrive at O under various phase conditions, exhibiting there either an interference pattern if O is sufficiently near the dashed horizontal line, or an acoustic shadow, or partial acoustic shadow, termed an acoustic penumbra.

As a practical instance of diffraction, consider Figure 2. An omnidirectional pink-noise source, A, is located 24 feet from a 12-foot high wall. The change of sound pressure level at point B, SPL_B, is illustrated in the lower diagram. It can be seen that this SPL decreases 3 dB per octave, because higher frequencies are bent less downward to the observer than the lower notes. Indeed, the larger the ratio of wavelength to the obstacle dimension, the greater is the diffraction of sound. One can readily hear this effect when a person speaks near a building corner while another listens on the other side of the corner: while the lower frequencies readily travel around the corner, the highs are barely audible.

Another diffraction effect is depicted in Figure 3. Here, the human head is assumed to be a sphere with a diameter of 7.2 inches, toward which is radiated a beam of frequencies at various angles. It can be seen from the lower diagram that for a ratio of sphere diameter to wavelength of sound equal to or less than 0.1, the diffraction effect is negligible, but becomes appreciable for the higher frequencies and large angles of sound incidence.

While in a geometric analysis of room design it is possible to predict the amplitude and direction of reflected sound rays from large hard surfaces, it becomes practically impossible to calculate the numerous and complicated diffraction effects from beams, columns, pillars, plaster decorations, mixing consoles and other physical objects in a room. To some extent this sound scattering is useful, because it tends to introduce diffusion in the soundfield, thereby producing a more uniform distribution of sound within the enclosure. On the other hand, the resulting spectral and phase changes of the innumerable components are so complicated, that one can only wonder at the human ear's extreme complexity in being able to make sense of the signals in the diffuse sound at the rear of a room.

This does not mean, however, that one should make things worse by employing details of construction that will increase unnecessary scattering, and the production of acoustic shadows and penumbras.

A case in point is described in Figure 4. The two diagrams on the left side depict splayed and

. . . *continued overleaf* —

Figure 2

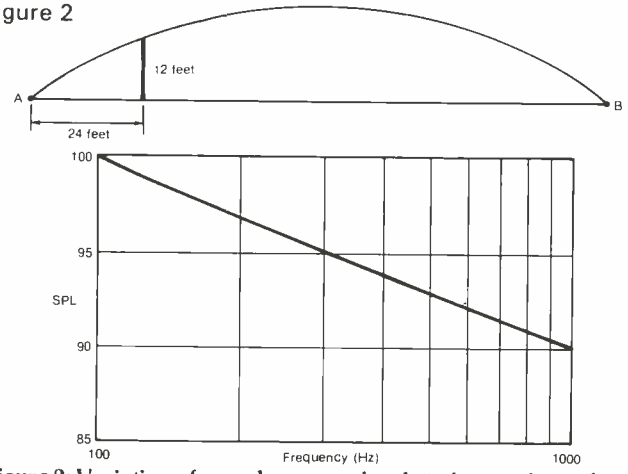

Figure 3

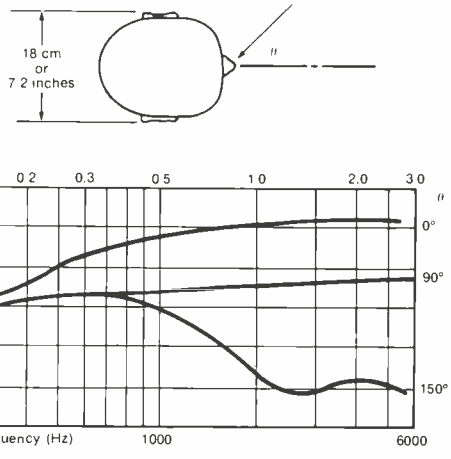

Figure 2: Variation of sound pressure level at observation point, B, when an omnidirectional pink noise source is located 24-feet from a 12-foot high wall. Point B is assumed to be much farther from the wall than A. Figure 3: Diffraction of sound by the human head.

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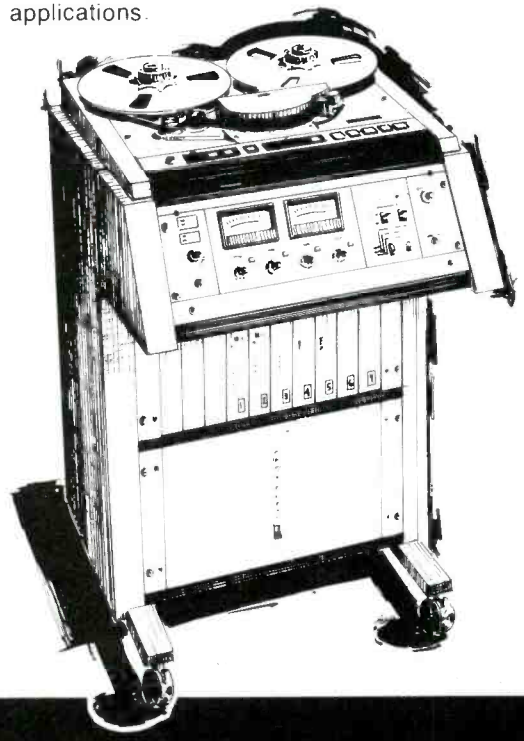

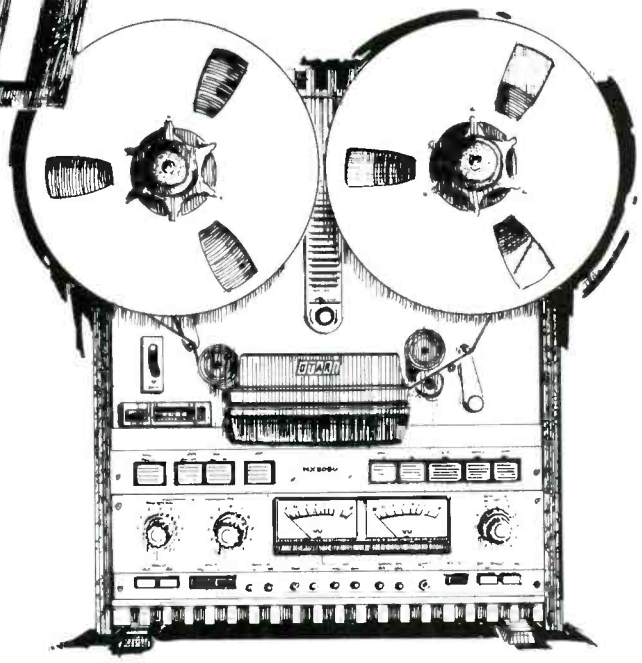

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angled windows constructed of flat panes of glass; the third diagram depicts a convex plastic window on the studio side, and flat or convex ones on the control room side (dashed lines). The area titled "AS" represents acoustic shadows constructed by the standard geometric method of making the angles of sound reflection equal to the angles of sound incidence.

The reason for using plastic sheet instead of glass panes for the convex windows lies in the fact that such sheets can be cold-bent on the job, provided the radius of curvature is kept within certain limits. For ¼-inch thick plastic panels with the tradename "Laxon," used for convex windows in the new re-recording studio at Audio Services in Hollywood, California, the radius chosen was equal to the panel length. In this instance, the Laxon sheets were 4.5 feet high and 16 feet long, so that a radius of curvature of 16 feet provided a "straight width" of 15.36 feet (0.96 x 16) for the window. The depth of the curvature, known as the sagitta in geometry, defined as the distance from the midpoint of the chord to the midpoint of the arc, comes to 1.952 feet (0.122 x 16), or 23.42 inches. The included angle between the center of the radius and the extremes of the window is 1 radian, or 57.3 degrees.

Laxon was chosen because it is practically shatterproof, and has been used for show windows at street level, lion's cages, and other objects that had to be light-transparent and non-breakable. The product's density is about half that of glass, so that for a highly sound-retardent window it is still necessary to employ thick sheets of flat glass behind the convex plastic pane. Preferably, these should be suitably isolated from the window frame structure by means of soft Neoprene surround extrusions located around the perimeters of the glass panes. If desired, the window on the control-room side can also be made convex by cold-bending a similar plastic panel there.

In the construction of convex windows at Audio Services no optical distortion was noticed by the plastic sheet, a condition which was investigated prior to the purchase of the large sheets of plastic by first bending a small first to the desired radius.

Diffraction effects occur also when a loudspeaker is housed in a cylindrical or rectangular cabinet. For this reason, monitoring loudspeakers in control rooms are preferably housed in a flat baffle above the control room window, the baffle extending the full width of the room. Figure 5 shows the diffraction effect of a cubical loudspeaker cabinet. □□□

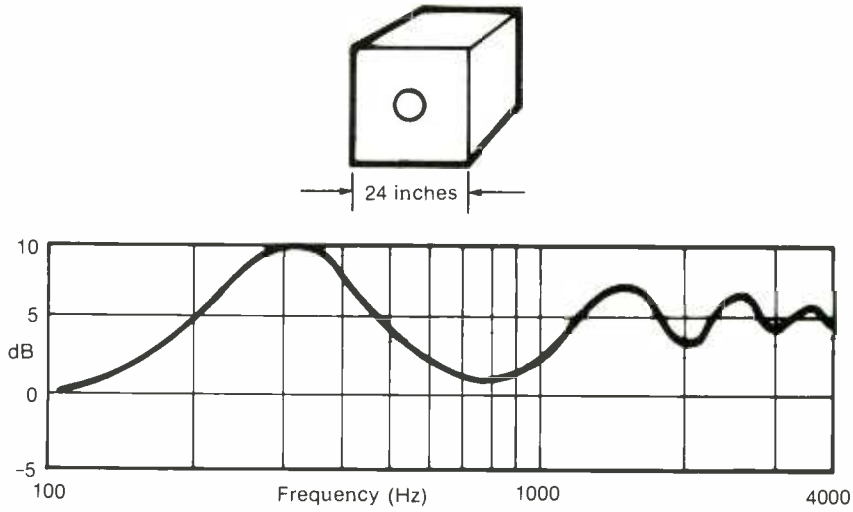
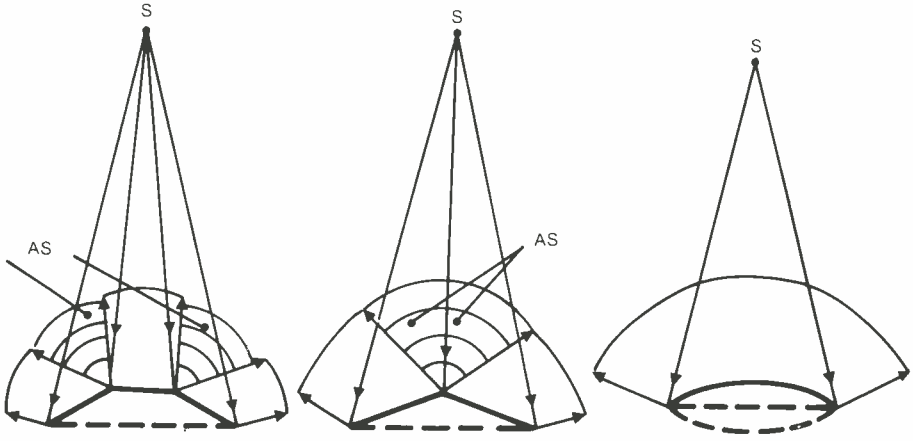


Figure 5: Response frequency characteristic showing the diffraction of sound from a 24-inch loudspeaker cabinet.

Figure 4: Diagrams on left illustrate sound reflection pattern produced by flat angled window panes. Areas labelled "AS" represent acoustic shadows, or areas of low sound pressure level, chiefly for high frequencies. Dashed lines signify flat or curved windows in control room.



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THE HIT SOUNDS IN STUDIO SCIENCE.

ZEN and the art of using WIRELESS MICROPHONES

by
Dale Scott
H M Electronics

Consider these three challenging audio problems; what do they have in common?

Rose Bowl — New Years Day, 1981. Prior to the game, six skydivers, unfurling a gigantic American flag, free-fall from several thousand feet above the playing field. As they descend, the skydivers sing "The Star Spangled Banner" over a live NBC network telecast.

Disneyland. As the floats in the "Main Street Parade" wind along their way, various instrumental versions of the same tunes emanate from them . . . in unison.

Radio City Music Hall. The all-new live entertainment format takes the form of a musical extravaganza. Up to 15 performers sing and dance not only on stage, but also from the wings, and even amidst the audience.

The common denominator? Sound technicians in each of these performance settings relied upon wireless microphones to solve a critical application problem that prevented the use of trailing mike cables.

The above examples illustrate some of the creative and diverse ways in which wireless microphones are currently being used. In fact, the application spectrum for the wireless mike is growing rapidly, and solutions to installation difficulties follow close behind.

First, let's examine the three prior applications to see in greater detail how the use of wireless mikes was implemented.

MOST COMMONLY ASKED QUESTIONS ABOUT WIRELESS MICROPHONES

1) Will my receiver pick up CB or FM radio transmission?

Professional wireless systems that operate in the VHF "Hi-band" radio-frequency spectrum (150 to 216 MHz) are immune from CB and FM radio interference. Economy "Lo-band" wireless microphones (30 to 50 MHz) *can* pick up CB calls. Tuneable systems in the commercial 88 to 108 MHz FM band often drift, and are overwhelmed by commercial stations — especially in large, radio-congested cities. Although there is no such thing as an absolutely clear channel, touring VHF Hi-band users, such as The Osmonds, have reported hundreds of problem-free shows in dozens of cities.

2) Can two or more transmitters operating on a single frequency be used with one receiver?

No. The receiver, seeking the strongest signal, will "hunt" uncontrollably from one transmitter to another. Each transmitter/receiver combination must be on its own frequency, and such frequencies must be carefully selected to ensure compatibility with the other systems. Always consult the manufacturer when using multiple systems.

3) Since they cost more, are UHF systems necessarily better than VHF systems?

UHF wireless systems (400 to 470 MHz; 900 to 950 MHz) are attractive in situations where so many UHF wireless mikes are currently in operation, that interference is inevitable. However, they offer no advantages in range, dropout immunity or other radio or audio properties. UHF systems cost more simply because UHF design, components, manufacturing and testing are more challenging than VHF design. Ironically, they sometimes suffer from interference in situations where a VHF system would not.

4) Can I use any microphone element with my wireless?

Yes. Some pocket transmitters are even able to provide switchable 1.5 V bias power for electret elements; other condenser mikes will need their own power supplies if phantom power requirements are different.

5) Do I need a Federal Communications Commission license to operate my wireless?

Some frequencies can be used by anyone; no license is required. Others can be used by anybody, but a license *is* required. Still others can be licensed only by broadcasters or filmmakers. It only requires filling out a form; no test is required. Consult the manufacturer.

6) Does the audio volume slowly fade as the transmitter-to-receiver distance increases?

No. The audio signal stays constant out to the limits of transmission range, even though the *radio* signal strength is decreasing.

7) I hear other radio signals only during dropouts — is this interference?

No — hearing other radio signals during a dropout is normal, and can happen if the ratio of these background signals is high compared to the transmitter signal (now weakened by the dropout). If you hear noises or other signals during normal, healthy transmission, that's *true* interference, and a different frequency must be selected.

8) To prevent receiving background radio noise, can I set my receiver "squelch" control at maximum?

Yes, but it reduces the operating range of the system. Always set the receiver squelch just slightly higher than the strongest background radio noise level for best compromise.

□□□

Rose Bowl

For 10 years, Bill Mayhew of Mayhew and Company (North Hollywood, California) has been selling, renting and installing wireless mikes. He deals with stage, screen and broadcast users. Recently, he rented six body-pack wireless systems to NBC for the pre-game live telecast, plus a seventh system for use by the referee during the Rose Bowl game itself.

Interestingly, even though transmitter-to-receiver distances were well in excess of standard equipment specifications, only standard systems were used. In other words, no additional transmitter power boosters or special antennas were employed. Transmitter power, however, was switched to the higher setting, 100 milliwatts. Both the skydivers and the referee were served by an antenna diversity system using three dipole antennas (Figure 1). Antennas were mounted at the highest possible points in the stadium structure, assuring line-of-sight reception. They were also oriented in two planes, perpendicular to the action. Antenna diversity was not used primarily to prevent radio dead spots (more on this later), but rather to ensure the best reception over the long transmission distances.

The wireless mike system used by the Rose Bowl referee was also modified slightly.

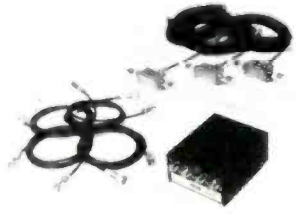

Figure 1

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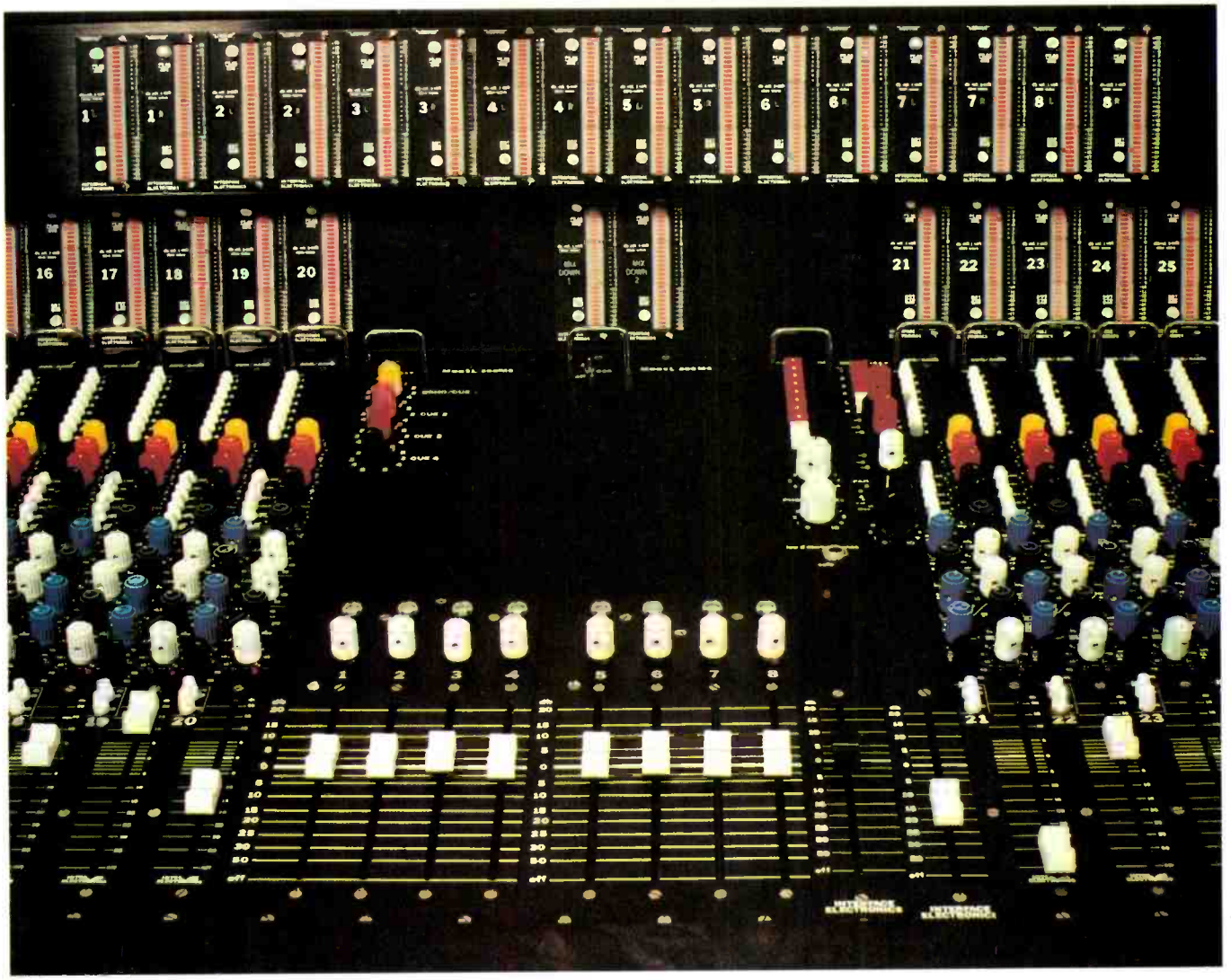

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Instead of using the transmitter on-off switch, a separate switch was provided for the mike element. This was done for two reasons. First, because turning a transmitter off causes a "pop" — it's the nature of the beast — and all wireless systems have this imperfection. Second, problems occur with FM radio systems, which are used in all professional systems. Difficulties exist even if operation is in the VHF or UHF bands, rather than in the commercial FM radio band. The receiver will seek out and lock on to the strongest signal it detects; if the transmitter is turned off, the receiver may well pick up other radio transmissions, such as mobile business radios.

The logical solution to this problem seems to be to permanently leave the transmitter switched on, and either turn down the received audio at the board (just like a regular wired mike, right?), or have the user (like our friend, the referee) turn his microphone on and off. But sometimes, being human, even referees forget, so control at the board is usually preferable.

While explaining this Rose Bowl application, Bill Mayhew recalled another story connected with a stage version of *Gone With The Wind* at the Dorothy Chandler Pavillion, in Los Angeles. Here, the burning of Atlanta was recreated. Live fires were used to heighten the stage illusion, and the flames spooked one horse. A wireless-equipped Rhett Butler finished his scene, walked to the wings, and told a stagehand (and, unwittingly the audience), "That horse is scared — less!" When the actor realized his *faux pas*, he decided to eliminate the problem in successive shows. As a result he turned off the transmitter on his way offstage and — you guessed it — produced a resonant "pop" followed by background radio crackle. From then on, Bill recommended leaving the transmitter on, taping over the switch so the talent couldn't get at it, and turning the sound down at the board in order to eliminate unwanted surprises. He reasons that the cost of leaving the transmitters on is cheap compared to the price of embarrassment.

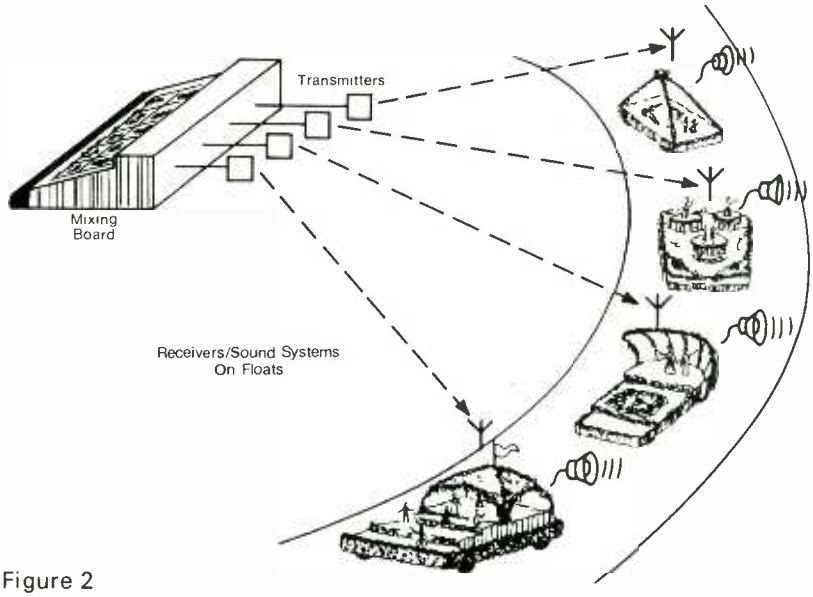

Figure 2

Disneyland

Disneyland and Walt Disney World have used wireless mikes for years. More recently, they have incorporated such technology into their "Main Street Parade." This was done to solve a specific problem: synchronization of music between floats. Formerly, separate tape players and sound systems were used on each float. Since there was no way to synchronize the music between floats, this caused a conflict of sound, especially when two floats were equidistant from a particular point along the parade route.

Disney technicians solved the problem by feeding individual synchronized music tracks to several transmitters — brass to one transmitter, rhythm track to another, strings to a third, and so on (Figure 2). Each transmitter was operating on a separate radio frequency, sending its track to a receiver and sound system mounted on each float. In this way, a fully-synchronized music program could be fed to all the floats in unison. More than one curb-side spectator has wondered, "How do they all play together like that?"

Incidentally, this same technique has been used in other major parades, including the Orange Bowl Parade. Imagine the extraordinary demands that the length of such parade routes place on the reliability of a transmitter-to-receiver radio link. Another parade application uses wireless microphones to beam the music and announcers' comments from one side of the street to sound systems located on the other side, thus eliminating overhead mike cables that might interfere with taller floats. This same technique is often used to extend communications or PA messages around race courses or across bodies of water (across the Potomac River, for example, during the unlimited Hydroplane Championship Races).

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What are some of the installation considerations in setting up jobs like these? According to Bill Mayhew and associate, Ken Keeney, antenna selection and placement are crucial for maximizing transmission distances. Ken Keeney advises the replacement of the small, 18-inch, "quarter-wave," flexible wire transmitter antenna with a half-wave, dipole antenna, thus giving a "free" 3 dB boost in effective radiated transmitter power. (This is equal to doubling transmitter power, without cutting battery life by half.) He also uses such dipoles on each of the receivers for improved reception. He keeps the antennas high, away from metal, and polarized in the same direction — usually vertical.

As Bill Mayhew added, "If we have slight indications of interference from another radio source, and we don't have time to change systems, sometimes changing polarity will help." He says that when the interference is from commercial FM or mobile business radios, both of which radiate from vertical antennas, he orients the transmitter and receiver antennas horizontally. For TV station interference with horizontally radiated signal patterns, system antennas are mounted vertically. This trick gives several additional dBs of rejection for unwanted signals.

Another recommendation is to bring out the antenna cable perpendicularly from any dipole antenna, at least three feet to prevent distorting the "field" of the antenna. This can sometimes mean success in marginal radio-frequency situations.

Radio City Music Hall

When Laurence and Robert Estrin were contracted to completely refurbish the original (1932) sound system at Radio City Music Hall, in New York City, they included one of the most extensive wireless mike networks presently to be found in a permanent installation. The Estrins now have their own company, Best Audio, in Hollywood, California, but did the job while Larry was president of Filmways Audio Group, also of Hollywood. The Radio City assignment encompassed one of the most extensive re-designs the Estrins had tackled, and yet the total upgrade was completed in just 30 days.

Originally the use of 36 to 40 wireless units was envisaged, but the extreme radio-frequency congestion in Manhattan bode ill for such an installation. Eventually, as many as 15 Dynamic Expansion systems were used simultaneously in productions of *Snow White*, and *A New York Summer* (Figure 3). To solve the problem of interference between wireless frequencies, a computer was used to determine frequency compatibility.

Figure 3

Figure 4

According to Tim Kerr, a freelance audio engineer who was instrumental in installing the systems, between two and three days were required to successfully install the diversity antennas (three diversity systems were used together), and to locate the receivers so they would not "talk" to each other. This consideration is often overlooked by engineers who, for neatness, stack together all the receivers next to their audio console. This is unwise, because all wireless receivers radiate local oscillator radio signals that can interfere with each other; a distance separation of two feet between receivers is desirable in multiple installations (Figure 4).

At Radio City, diversity antennas were needed because of the enormous amount of steel on stage (resultant problem to be discussed later). The Hall's facilities include a rotating stage, on-stage elevators, and a bandstand, motorized and moveable from the rear of the stage to the front. Antennas were placed on the floor behind the footlights, as well as stage left and stage right, suspended from the proscenium. This meant antenna cable runs of between 100 and 125 feet; RG-8 and antenna amplifiers were used to boost the signal to the diversity boxes.

Tim Kerr also found that the transmitters were being overdriven by the combination of loud singers and hot electret mike elements. Changing to lower output microphones helped, but Tim still had to contact engineers at HM Electronics, who devised a front-end adjustment to handle outputs from different mike elements. This feature has since found its way into the company's standard line of wireless microphone product; its main benefit comes from the transmitter's ability to handle a wide range of input signals.

Similarly, a special four-stage RF filter — also a standard option now — was designed at HME to enable the 15 systems to be used together. A benefit of Radio City's steel structure is the attendant aid in preventing interference from radio sources outside the building from reaching the wireless mikes.

In addition to the major challenges of the RCMH set-up, some minor demands were also encountered. For example, the Seven Dwarves' costumes (*Snow White* production, of course) caused problems. Their beards brushed over the mike elements and caused noise. Strange but true, the dilemma was solved by mounting the mike elements in their nostrils — the masks' nostrils, actually. Also, antennas had to be wired up their backs because the Dwarves kept stepping on the 18-inch flexible transmitter antennas.

This brings up an interesting point regarding transmitter antenna placement. The most commonly accepted method is to mount the antenna at waist level, and run the antenna up the back or over the shoulder. This should make it parallel with the receiver antenna, which is also usually mounted vertically. Alternate, recommended locations for the transmitters include the armpit or crotch, with the antenna run down the arm or leg. To hold the antenna in place, a rubber band should be tied at the free end, the antenna and rubber band then run up the back, and a safety-pin used to hold the other end of the stretched rubber band to the clothing (Figure 5).

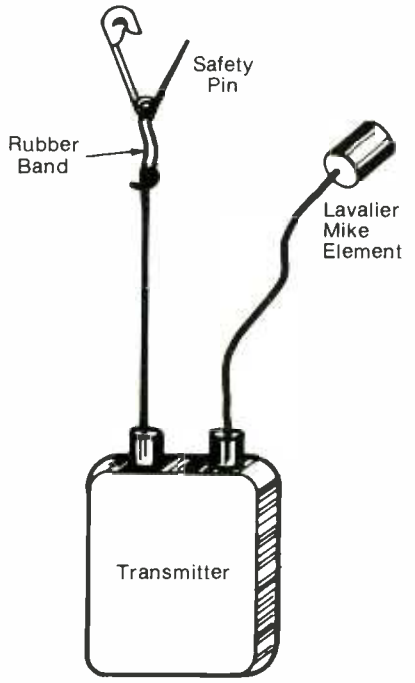

Figure 5

In addition to the Dwarves' peculiar trouble, a second problem encountered at Radio City was static-popping caused by electric motor brushes, SCRs (as in dimmers), and inadequately-suppressed engine ignitions. Such interference entered the receivers through the AC power lines into which they were plugged. Since the noise was found to be AC-line coupled, it went away when the antenna diversity boxes were powered by batteries instead of mains power supplies.

With all these comparatively minor complications, it is fair to ask just how wireless mikes have been incorporated into various productions. Bob Jani, President of Radio City, aimed to metamorphize the

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shows into musical spectaculars. Such a change presented problems because the hall was designed for vaudeville performers, and as soon as the talent stepped back from the footlights the dialogue faded, and then disappeared. Even a 35-piece orchestra was muffled when it played at stage rear. Performers could not use wired microphones because cables became tangled, or were severed by the bandstand that rolls on steel wheels.

Fortunately, the wireless set-up has eliminated these problems. Performers have free run of the stage — all 9,500 square feet of it — and they can even play their parts from the audience. As Larry Estrin reports, "Since every line is important, every line must be heard, and it is!" The systems have been used twice daily for two years, and in Bob Jani's evaluation, "There is no way we could produce the types of performances we do without wireless microphones. They have added an intimacy to Radio City's big stage."

Radio City Music Hall, Disneyland, and The Rose Bowl are just three examples of wireless microphone applications, and the flexibility, professionalism, and drama they can add to events.

Dropouts

Let's not kid outselves. A *perfect* technology does not exist in any field, and wireless mikes are no exception. Knowing that imperfections are part of any technological package, users like to put equipment to "the test," whatever that evaluation might be. Generally, the accepted method of evaluating a wireless system is to see how *far* it will transmit. Procedure: run out of the building with a transmitter; make a transmission; then return several minutes later and inquire whether everyone in the room heard you while you were at the drug store down on the corner buying cigarettes. Result of test: interestingly, it seems most people can walk approximately the same distance regardless of whose VHF Hi-band system they are evaluating!

This similarity is understandable since most systems radiate about the same amount of power, from the same type and length transmitter antenna, to receivers with about the same sensitivity and antenna length. Even doubling transmitter power from, say, 50 milliwatts to 100 milliwatts does not double the range; it may extend the range by 20%, but halves battery life in the process. Furthermore, the user soon discovers that the system may transmit 2,000 feet, but he has mysterious dead spots only 20 feet away from the receiver; or the system exhibits frying, sizzling, or whooshing noises during movement. In short, the user has encountered "The Dropout."

Dropouts in wireless-microphone reception are caused by the same phenomena as dropouts in an FM radio, especially in car systems, and "ghosts" during TV reception. All these media operate on a line-of-sight transmission path, rather than bending around corners like AM transmission. Such straight-line transmission makes it possible to partially or totally lose the radio link due to one of the following two cancellation effects:

1. Multi-Path Cancellation. The most common form of cancellation, noises or loss of radio signal in a car's FM tuner are of this type. A practical illustration of this occurs when a car pulls up to a stoplight in traffic, resulting in noise or transmission fade-out. Then, when the car moves forward a few feet, the signal comes back clearly. *Voila!* Multi-path cancellation. The FM station's transmitting tower is sending out its signal in all directions (horizontal polarization), and one of those radio waves bounced off a flat metal surface — the fender of an adjacent car, or the structural steel in a nearby office building. This reflected radio wave then arrived at the car's FM antenna somewhat later than the direct wave from the station's tower. Since the reflected wave is out of phase with the direct, it will totally or partially cancel out the primary wave.

This situation is analogous to the problem encountered with wireless microphones. The only difference is that with mikes, the "radio station" moves and the receiver stays in one fixed spot (Figure 6). The dead or noisy spot is know as a "null" or "dropout," and can occur regardless of how close or far apart the transmitter and receiver are. As a matter of fact, short-range dropouts are much "snappier" than long-range ones, because both primary and reflected signals are healthy; thus they "butt heads" very hard. Long-range receiver-to-transmitter situations, however, create weaker dropouts, since the bounced (longer-path) wave, which is usually much weaker than the direct wave, has to travel farther. As mentioned earlier, multi-path cancellation is the most often-encountered problem in wireless microphone installations, and is subject to varying opinions and misconceptions regarding solutions.

2. Absorption Cancellation. As its name implies, this type of cancellation is caused by the radio waves from a transmitter being absorbed by any intervening body located between it and the receiver, which can include the body of the person wearing the microphone. Incidentally, this is one good way to determine the solidity of the system's radio performance. A well-designed body-pack or hand-held wireless microphone should transmit through exterior as well as interior walls. Audio should not fade when the talent turns slowly on his heels, even out to the maximum specified range. Be skeptical of statements by the manufacturer such as, "Range up to 'X' number of feet."

As a side note on the evaluation of wireless mikes, try this exercise about 300 feet from the receiver, in line-of-sight:

1. Ball up all the flexible body-pack antenna in your hand, along with the microphone cable; talk into the mike.

2. Hold the body-pack transmitter in your hand and twirl the antenna slowly like an airplane propeller; talk into the mike while twirling.

Any radio anomalies noticed by your colleagues back at the receiver will indicate:

Case 1: The system is prone to feedback RF into the audio section, due to insufficient shielding between the audio and radio sections of the system.

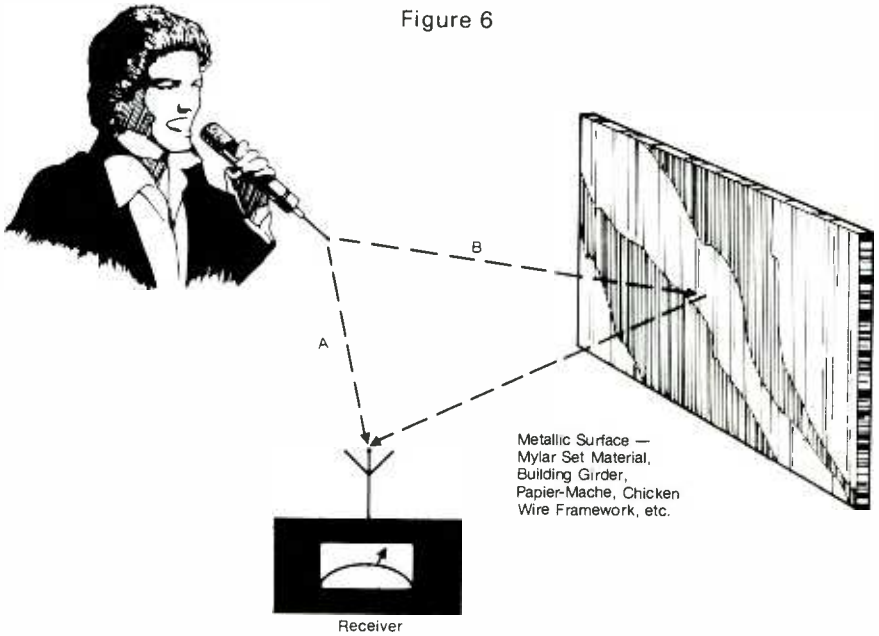
Case 2: The system performance is critical with regard to polarity orientation of the transmitter and receiver antennas with respect to each other.

Diversity Reception

In summary, multi-path and absorption cancellations are the two most frequently encountered interferences. Phase cancellation can also occur, but only in relatively few and specific situations. Of the three types, multi-path cancellation is the most troublesome problem. Fortunately, the difficulty can be reduced with varying degrees of success by employing a technique called Diversity Reception. The degree of success, however, depends on the design effectiveness of the diversity scheme, and on how well the antennas are located and oriented.

. . . *continued on page 71* —

Figure 6



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WIRELESS
ZEN
MICROPHONES

Interestingly, diversity reception was not originally designed to eliminate multi-path cancellation. It was developed during World War II to eliminate "Ionospheric Fade" in round-the-world Allied military radio networks. Long-range radio travels around the globe by bouncing off the underside of the Ionosphere. Because the Ionosphere is often in a state of undulation, radio waves are scattered and/or absorbed, thus degrading reception quality. Since a relatively small area was affected, the problem was eliminated by erecting two separate receivers and antennas. The operator could then switch back and forth between antennas, and feed the stronger signal into alternate receivers.

Later designs incorporated comparator circuitry that sensed which antenna was receiving the stronger signals, and switched the output accordingly, thus obviating the need for human attention and action. The technique was well-suited to fixed-location transmitter/receiver networks, because they were located and constructed to avoid multi-path cancellation.

The emergence of microwave mobile communcations systems, such as business telephones, necessitated a re-evaluation of antenna-array techniques for signal reliability. Most of the significant research in this area was done by Bell Telephone Labs. Their theoretical models indicated that a significant increase in *multi-path-free* performance could be obtained by using "equal-gain combining" antenna diversity, as compared to the wartime "switching" diversity systems. Figure 7 shows the relative effectiveness of switching and equal-gain combining systems in reducing dropouts due to both multi-path *and* phase cancellations.

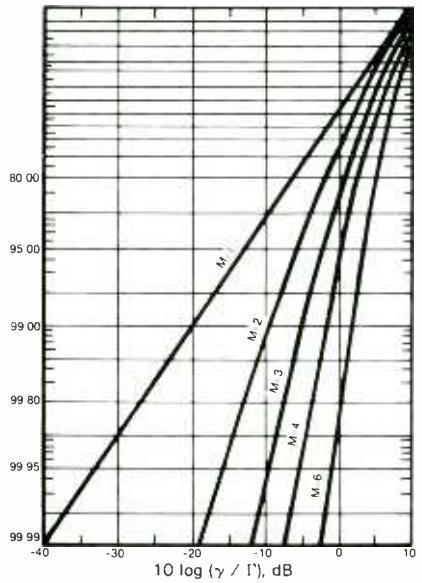

Figure 7: The probability distribution of signal-to-noise ratio for an M-branch diversity combiner. (Taken from Microwave Mobile Communications, *Edited by William C. Jakes, Jr.; John Wiley & Sons, 1974; page 322. Reproduced with permission.)*

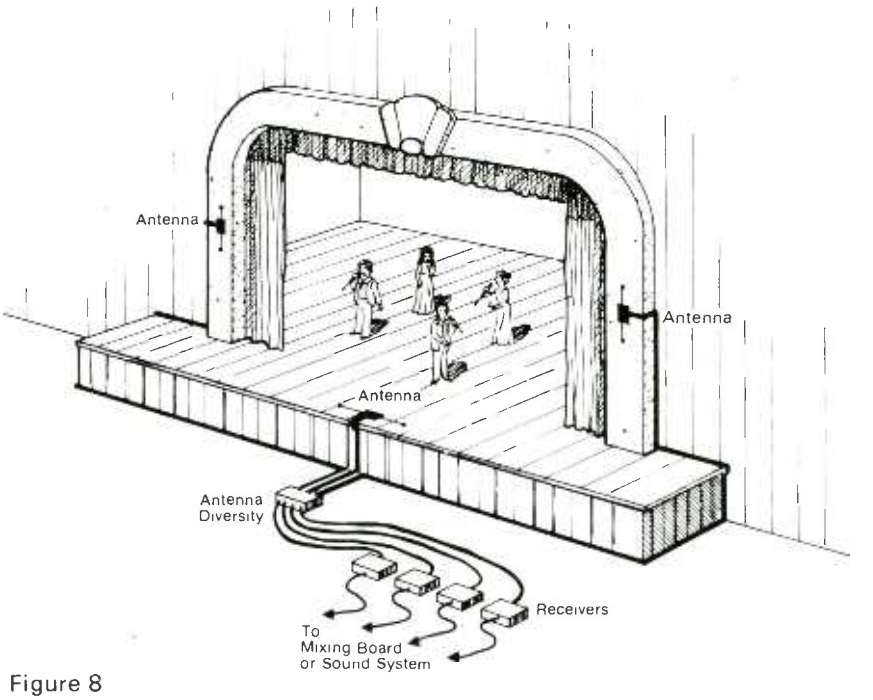

Figure 8

("M" on the diagrams indicates the number of antennas being used in each scheme.)

Consider the case of a dropout which causes a 10 dB RF (and audio) signal-to-noise degradation. Notice that for both curves, a single antenna will be drop-out free over 90% of the theoretical area coverage. Switching between two antennas further improves that figure, giving a 99% drop-out free area, as shown where M = 2 curve intersects the 10 dB SNR coordinate on the selection diversity diagram.

Use of the same two antennas is more effective, however, if they are used in an equal-gain combining diversity configuration. Bell Lab researchers found that the area immune to the 10 dB RF signal-to-noise loss figure improved to 99.3%. This figure would have been even better, but a new problem arose. In a certain number of cases, the two antennas would *phase-cancel* each other out, since they were both "on and receiving" continuously and simultaneously, not switching back and forth. The obvious solution was to increase the number of antennas in the system from two to three. Thus, the only time phase cancellation can occur is when the signals received at two of the antennas are 180 degrees out of phase and equal in strength, *and* the third signal is passing through the zero crossover point (in other words, not contributing any signal). Since a wireless system is used during dynamic situations in which the talent is usually in motion, the statistical occurrence of this condition is rare. Logically, the chances of null zones enveloping three antennas are much smaller than if two antennas were used. The end result is that the three-antenna combining system improves the -10 dB SNR figure to 99.97%. This indicated to researchers that the combining technique would theoretically eliminate 97% of the dropouts left by the switching diversity system in mobile microwave communications systems.

Since wireless microphone operational parameters are categorically similar to those involved with vehicle-based mobile radio, this technique has found successful application in this area. In fact, several hundred triple-antenna combining systems are in regular use by virtually all segments of the professional audio/entertainment industries (Figure 8). To prove the point, it is next to impossible to watch an evening of network programming, and *not* see at least one show using such a system. Dramatic series and sit-coms use body-pack systems with hidden lavalier mikes, as well as the more obvious hand-held microphones.

Related Problems With Wireless Microphones

So much for the Dreaded Drop-out. But no sighs of relief; other obstacles to perfection remain to be addressed. For instance, a low-technology item know as a battery ranked a surprising *first* on the list of wireless mike problems, according to major motion picture studios in Hollywood, where a large percentage of the above-mentioned dramas and sit-coms are produced. Here, reliability is one of the keys to cost effectiveness, since dozens of highly-paid personnel can be involved in a film shooting. Interestingly, studios indicate that over 50% of all wireless problems are not intrinsic to the basic systems. After batteries, broken wires and connectors for mikes and antenna problems ranked second and third on the list. In addition, user misapplication and incorrect operation account for a high percentage of complaints. This last item indicates the need for pointed emphasis on proper instruction in system operation. An encouraging fact of all these non-intrinsic problems is that their solutions are fairly easy and obvious.

Another important element in the motion picture industry is sound quality, since a take has to be good enough for the finished soundtrack. Even though poor sound can be used as a guide to "loop in" dialogue during post-production, looping should be avoided if possible, because the talent may be on

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WIRELESS ZEN MICROPHONES

location in another country when it's time to insert the required dialogue. For this reason, many actors and actresses are reluctant to write looping agreements into their contracts. If conventional mike cables can't be used in a particular scene, looping becomes a necessity, unless wireless microphones are utilized. The cost-saving and convenience of a wireless mike cannot be overemphasized here.

The telephoto lens in movie-making also dictated a need for wireless mikes. Boom cameras could not be used in many situations, and even wired lavalier microphones proved undesirable, since several hundred feet of cable might have to be buried or hidden at great cost.

In addition to the obvious physical conveniences of a wireless system, recent improvements also give much more dynamic range than did earlier units. In fact, soundmen report that the new wireless microphone generation sometimes has too much dynamic range. They comment that they want the output from the new systems attenuated, because it can easily overload their mixer boards and Nagra recorders, previously considered the standard for dynamic range testing of wireless mikes. This complaint is probably a compliment to the newest advancement in wireless mikes: Dynamic Expansion.

Dynamic Expansion uses microcircuit technology to expand the dynamic range of wireless mikes to around 100 dB, with reductions in the noise floor of up to 35 dB. Some of the logistics involved include compressing the audio signal at the transmitter by a 2:1 ratio, then converting to a radio signal that is then sent to the receiver. In the audio portion of the receiver, expansion brings back the 100 dB-plus dynamic range. Any noises injected into the process in the radio link (for example, static) are reduced by the expansion process by the same 35 dB, which can be an important side benefit. The technique was developed years ago by the telephone industry to reduce background noise in long-distance telephone circuits, and goes by the more familiar label of "companding."

The challenges in designing an inconspicuous compander circuit for a wireless system are the same as in other audio signal-producing systems: freedom from noticeable noise-gating, pumping or inaccurate compressor-expander tracking. Sound mixers may have to ride gain for the first time with wireless mikes but, thanks to Dynamic Expansion, they can clearly record footsteps in the snow on the same soundtrack as an undistorted pistol shot.

The same advantage applies to broadcasters. Although they can transmit about 65 dB of program material, broadcasters do not want that material to be distorted by a wireless mike that is dynamic range-limited — even if the dynamic range capability is greater than broadcast standards. Such users want a non-limited signal that can be compressed to suit their requirements.

CASE EXAMPLES

The Osmonds

The use of Dynamic Expansion is equally attractive to live performers, but for a different reason: it lowers the background noise level of their wireless system, and therefore their overall sound system. Talking with Klay Anderson, presently with Performance Audio in Salt Lake City, provided some examples of the company's experience with wireless mikes. Two years ago Performance Audio supplied four Dynamic Expansion, hand-held wireless mikes and two cordless guitar systems to The Osmonds (Figure 9). Klay has served as soundman for about 500 stage shows worldwide: "The systems were just like a piece of wire. The Osmonds like to establish intimacy, and wireless microphones have enabled them to do that. They like a lot of interaction with their audiences."

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enter from the rear of the theaters, working their way to the stage, greeting and chatting with audience members via the wireless mikes to an on-stage sound system. As Klay explains, "Often they dance out into the audience, singing and playing. There is no way they could do that with wires."

Many times The Osmonds play on rotating stages; Klay says the group are wireless for about 75% of their performance. Although they had a diversity system, he quit using it and has "never missed it." The only time dropouts occurred was during a warm-up act in front of a closed sequined curtain. Even with diversity reception, Klay experienced problems. When the curtain was opened, however, the dropouts disappeared.

Only two other problems were experienced in 500 live shows. Problem one: Donny and Alan both chipped their teeth on the hard windscreen of the Shure SM-58 heads; Klay replaced the heads with SM-57s covered with large fabric windscreens. Problem two: A zealous stagehand played a 20-second impromptu rendition of "Louie, Louie" over the stage system during Marie's solo version of "Tenderly;" seems he had picked up Donny's cordless-equipped guitar backstage, and . . .

Theater Applications

In another part of the country, Bob Cavin, chief engineer of Harry McCune Sound, San Francisco, has also had his share of wireless experiences. Liza Minelli came on stage one night with a surprise! A hand-held wireless mike seemed to be in a berserk mood, but the true culprit turned out to be a sequined dress. Moral: the sound technician should coordinate with set designers and wardrobe personnel, so that he knows the location and type of any metallic (radio-reflective) set or costume materials. While on the subject, wardrobe people ought to know by now that they should not cut off the ugly little black antennas of body-pack transmitters "for neatness!" (It has happened.) On the other hand, they could help design pockets, pouches, or straps in which to hold the body-pack.

Bob Cavin comments that perspiration from a performer can destroy in weeks the circuitry of any wireless system. As a counter-measure, he recommends liberal doses of anti-perspirant and a baggie. One major Theme Park uses condoms; buys 'em by the gross, but never tell Purchasing what they're used for. For the more conservative, it is considered doubly-safe to bag the transmitter from one end, then double back the transmitter and antenna wires from the opposite direction for a double seal (Figure 10).

On the subject of batteries, Bob Cavin and all the others interviewed said they used alkaline batteries, although the transmitters can also utilize NiCad batteries. They all felt that the uncertainty of whether or not the NiCad units were adequately charged was even more critical, when it is remembered that the life of the battery is only about 1½ hours, versus 8 hours for an alkaline. In addition, NiCad batteries have a definite service life, albeit longer than an alkaline; then they must also be discarded. Too few deep discharges shorten their lives considerably.

HM Electronics specifically recommends using only the Mallory MN1604 for several reasons. Most important, they have compatible-sized terminals, specifically on the Japanese standard. EverReady and Ray-O-Vac batteries are on the slightly larger American standard, which can make for a non-snug battery connection. Presto! Low battery symptoms. Most experienced technicians test each battery before use with a "loading" battery tester. A voltmeter that does not load the battery gives falsely optimistic readings. Also, engineering studies indicate that Mallory Duracell batteries have the lowest internal noise level. Intrinsic battery noise can get into transmitter electronics; yet another reason for HME's recommendation of the MN1604.

More reports on wireless performances come from the five Broadway and other companies' productions of the award-winning musical, *Evita*, based on the life of Eva Peron. The road companies have six Dynamic-Expanded body packs (one as a spare), and triple-antenna diversity systems. All five of the principal performers use wireless mikes.

"It is a tough show to mix," says Larry Spurgeon, assistant sound designer for Abe Jacobs, renowned theatrical sound designer. Many cues must be fed to the talent, and the sound mixer must be on his toes to turn down each actor's mike at the board, to prevent the audience's hearing side comments between the performers on stage.

Larry Spurgeon has a few specific problems to overcome. For example, he found that Mylar and metal sets caused

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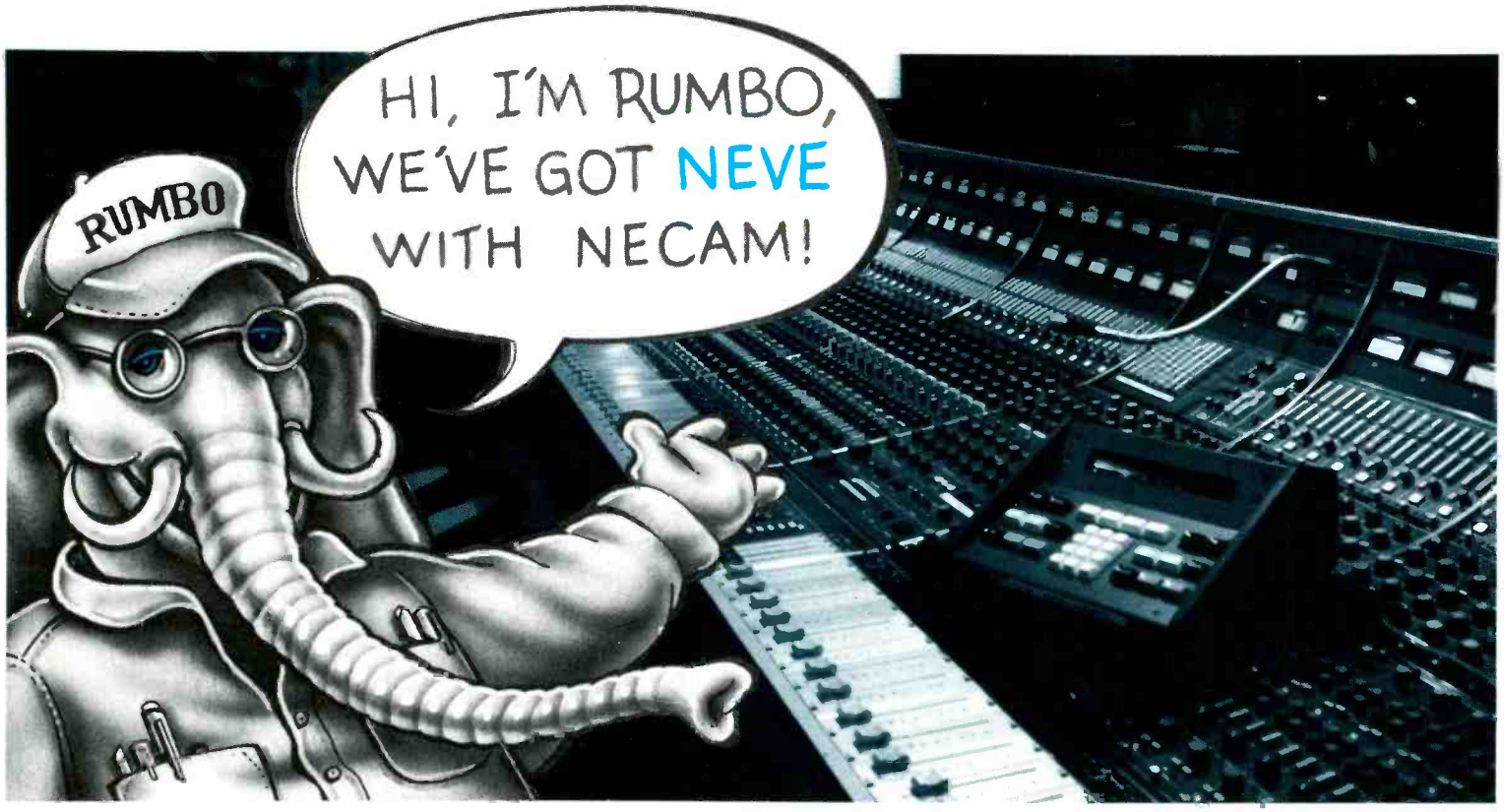

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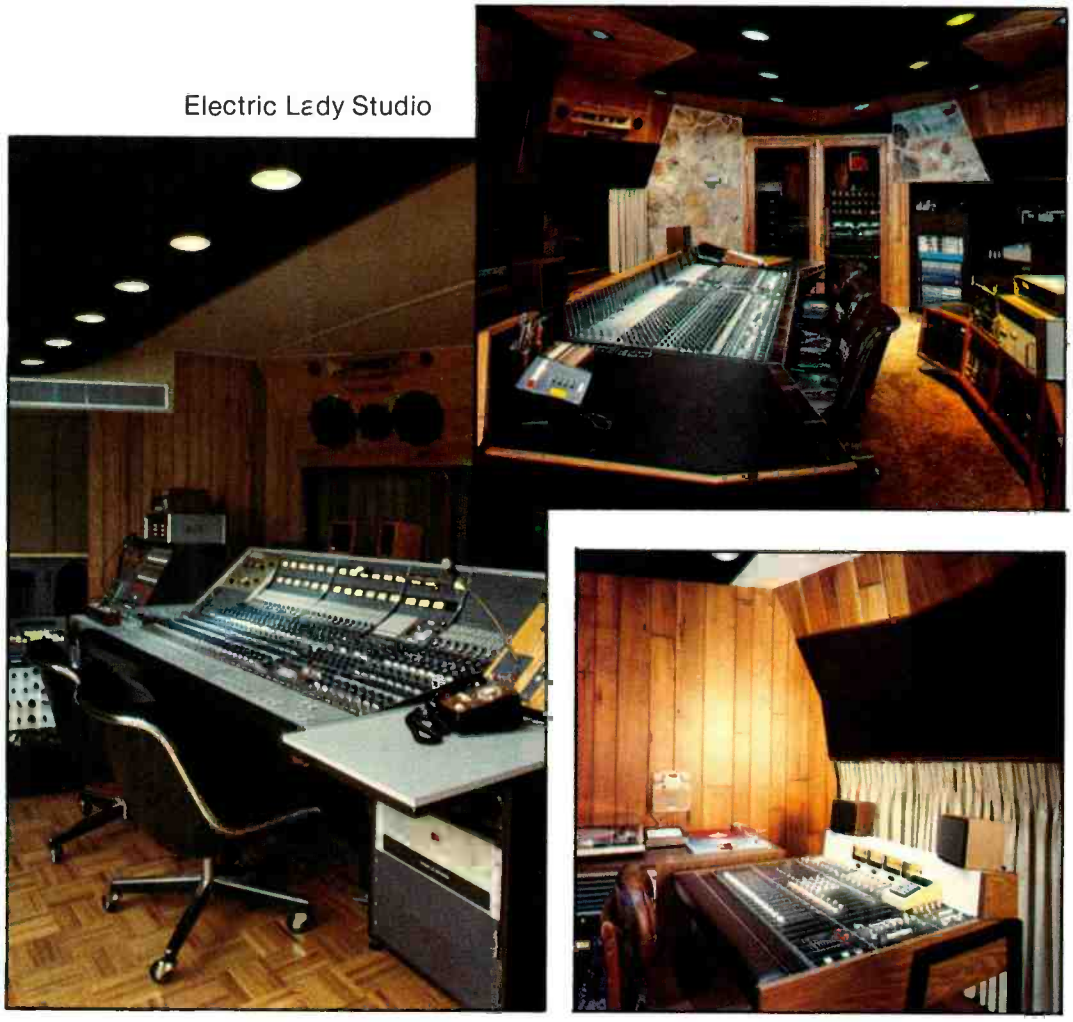

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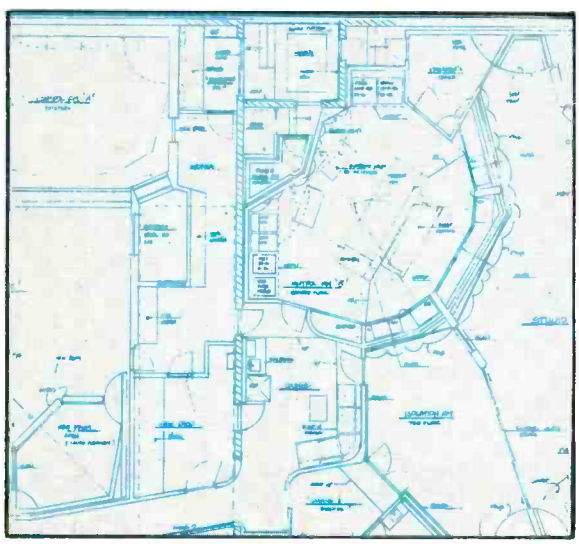

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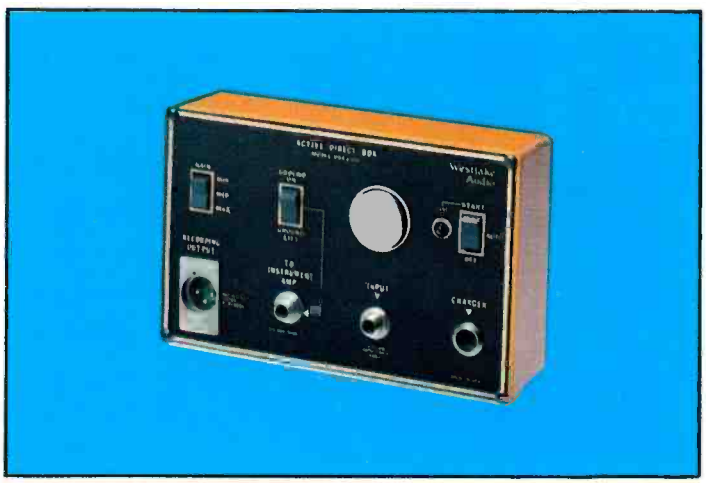

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problems in Chicago, but not in Los Angeles. Antenna diversity, plus careful antenna location and mounting, solved that problem. He was careful to keep all antennas at least three feet from metallic surfaces.

Other routine precautions included having an extra system on a separate frequency compatible with the others, because "one wireless channel always has interference on it." The sound technician with each company checks batteries every night with a tester, and also walks the stage with each transmitter to test for radio anomalies. When doing so, he mounts the transmitters on the body with the antenna up the back (the way they are worn in the show), since the body can absorb radio waves. For this reason, carrying the transmitters in the hands with the antenna hanging out in space is not an adequate test.

Larry Spurgeon has also noted other factors that he feels must affect radio performance: the size of the crowd in the theater; storms; and maybe even sunspots. In short, the successful technician must deal with a myriad of possible interferences and combinations for solutions.

Some General Applications Comments

In researching and reporting on the various uses of wireless mikes as applied in different venues, many experiences, techniques and problem-solving methods came to light. Several of these comments from various professionals mentioned in this article can stand alone as worthwhile tips for anyone using the technology:

- Soundmen have reported that their transmitters were "popping." Turns out they had synthetic-fabric blouse material rubbing on the mike element itself. When it discharged, it gave off an audible "snap," which was picked up by the mike element itself, not the transmitter.
- Always expect your problem at the transmitter, rather than at the receiver. Possible culprits: the earlier-mentioned batteries; antenna/mike connectors; among others. Even suspect human error, like performers who may wad up their antennas and put them in their pockets!
- A severe dropout problem during a *Music Man* production at the Pantages Theater in Hollywood, could not even be helped by antenna diversity. The Problem: papier-mache scenery, 30 feet wide and 20 feet tall, with a chickenwire screen foundation, a structure that acted as an excellent radio reflector. What an antenna! So, reasoning that a good radio reflector should also make a good antenna, the technicians wove one of the dipoles into the chickenwire, and the other two on the apron, thus killing all dropouts.
- NBC needed to cover three locations in a building: the studio; out in the hallway; and downstairs. One antenna was placed high in each area, oriented vertically to be parallel with the body-pack antennas mounted on the actor's backs. Result: coverage of all three areas even though they were separated by building structural metal.
- Always keep the receivers on stage, close to the transmitters. Then, come out of the receiver to the board, rather than putting the receivers in the back of the room with the mixer. This is a better system because:

1) RG-8 has less loss per foot than air for sending messages; and

2) the room should have been checked thoroughly for dropouts for *each* transmitter/receiver set, and all batteries and transmitter/receiver sets checked *before* showtime.

Then there will be no need to have the RF level meters in front of the soundman; he is bound to be too busy just running sound to watch meters. And even if one of the meters does indicate trouble, what is the soundman going to do about it? Leave his board and run on stage to fix it in mid-show? Better to ensure a solid radio link by putting the receivers near the performers.

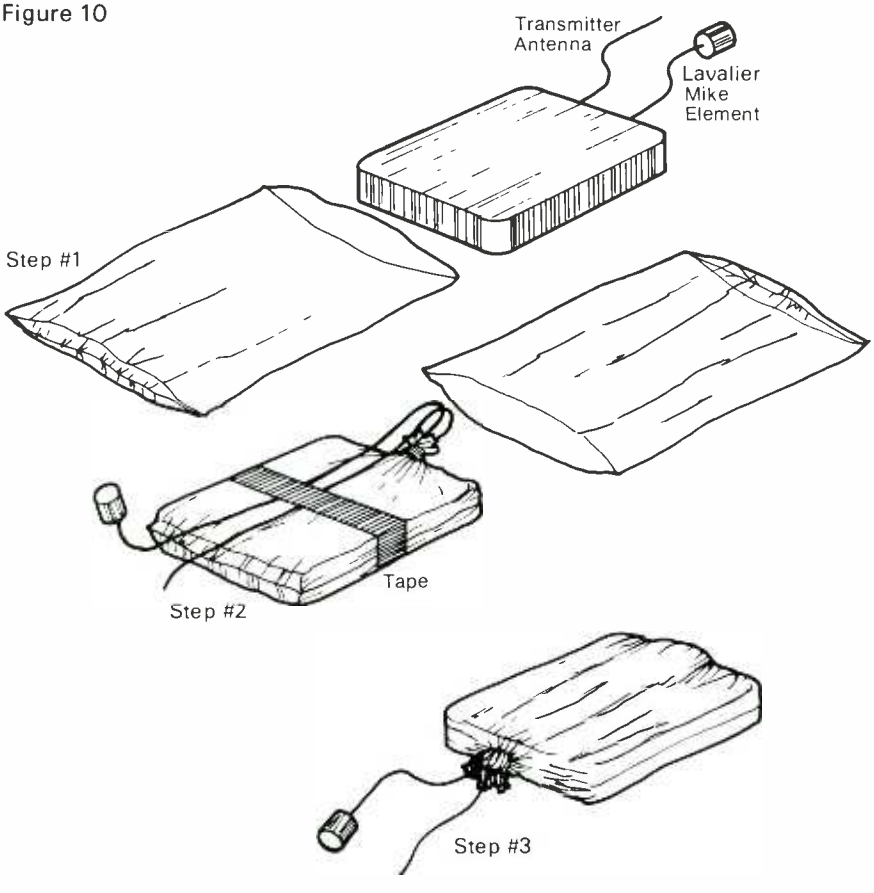
- Diversity is needed where there are reflective surfaces, indoors or outdoors. TV studios always need them because of light fixtures. Orient two antennas vertically, with one horizontal, and at right angles to the action.
- Keep all antennas at least 18 inches away from plane metal surfaces. Be suspicious of walls; they may contain sheet metal heating ducts or steel girders. Enter The Dropout.
- Possibly lay the antennas on the floor under the stage. (Careful: the concrete floor has a steel mesh reinforcing grid called a "ground plane," which sucks the words right out of a wireless mike.) Do not worry about putting wood or other non-metallic flooring over antennas and cables.
- Make certain the antennas are at least 8 feet apart, so that two antennas don't get caught in the null spot. On the other hand, don't worry about getting the antennas a long distance apart. The intent of diversity reception is to eliminate dropouts, not extend range, although that's a side benefit. Mainly, follow the manufacturer's instructions when hooking up the antenna diversity box, and you will get no dropouts.

On the point of following manufacturer's instructions, the importance of strict adherence cannot be over-emphasized. HM Electronics has observed that such adherence is the single most important factor in ensuring success with wireless microphones. It is not important to understand the theory of mobile radio transmission and reception, but it *is* important to use the equipment properly, like any tool.

In conclusion, wireless microphones are often used because they have captured the imagination of creative artists and directors. Like never before, acts can now add drama, intimacy, power and visual stimulation. Alto Reed(!), saxophone player for the Bob Seger Silver Bullet Band, provides a perfect example of the creativity and sheer guts that can be tapped when "going wireless." Alto, like Tinkerbell, flies around in a harness on a tether wire, above the inflamed audience, playing solos with one hand, pointing skyward with the other, and never missing a note! He also plays solos while soaring skyward in a hot air balloon.

But beyond daredevils like Mr. Reed, wireless mikes are becoming equally attractive because they offer the capabilities for sound craftsmen to solve difficult miking problems. Wireless systems are tools of convenience and versatility, as well as instruments of innovation. □□□

Figure 10



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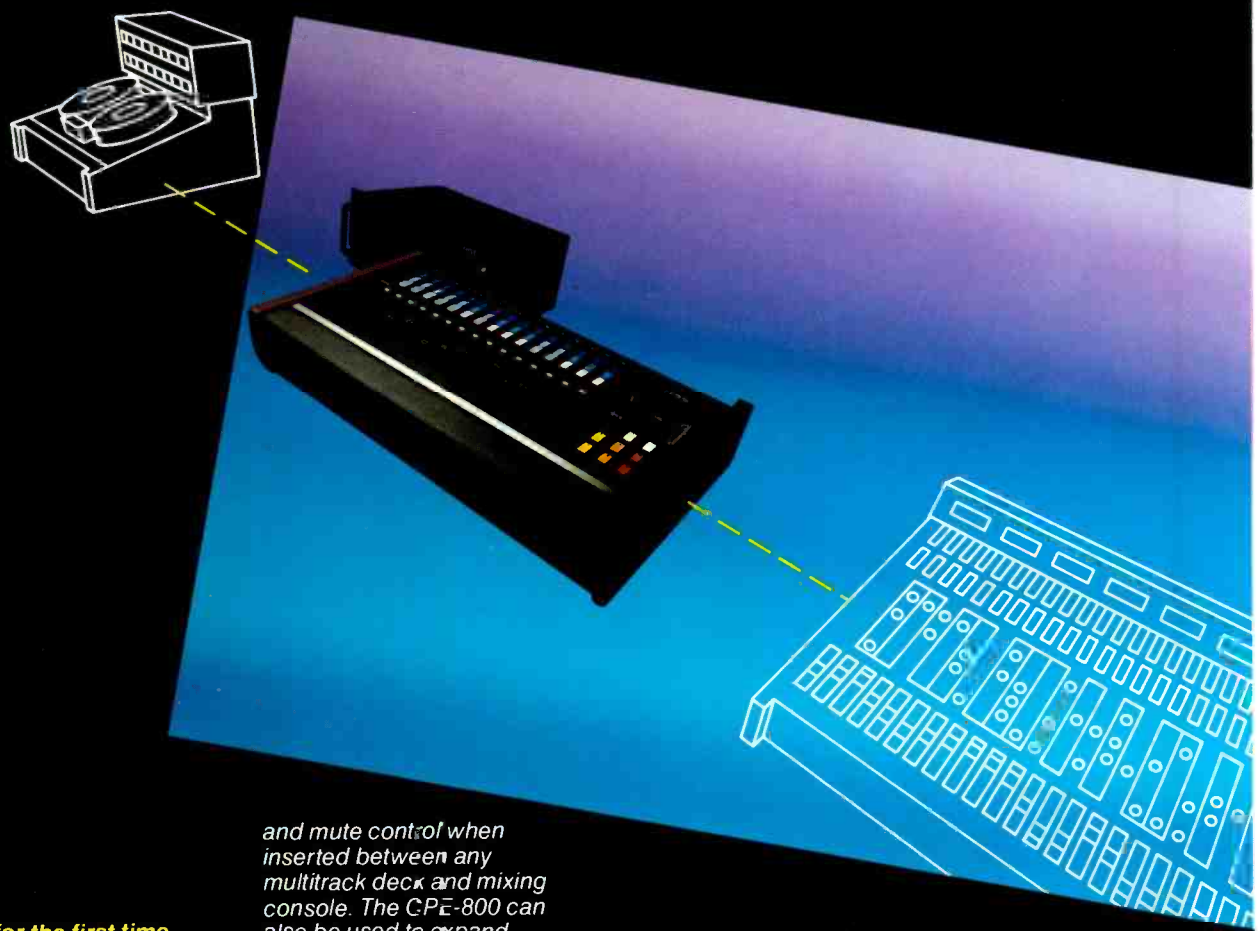

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AUDIO/VIDEO RECORDING

. . . the author's personal experiences . . . entering the field . . . learning . . . founding her own company . . . and producing

Creative Visual-Music

by Kim Dempster

I first discovered video when a couple of friends asked me to deliver a video tape to a nearby television station for broadcast. I stayed and watched the show, which was an exceptionally good one on the music business. Since I was an artist, and had become involved with performance pieces, I started talking with these guys about their production, which at that time I considered to be just a mess. It was basically a news show, and very heavily dependent on other people's material. I tried to help them make some sense out of the way they strung together these "handouts." I was very excited about Rock and Roll and New Wave music and theater; eventually these interests of mine became the flavor of the show.

I fell in love with the early Devo and Lene Lovich visual pieces, and I guess I tortured the company until they let me try my own production. We stole tapes out of garbage cans to shoot on, and "borrowed"

. . . ***continued overleaf*** —

the author —

Kim Dempster *started her creative career as a video music producer and director with a San Francisco-based television company. There she produced and directed video for such acts as Jefferson Starship, Iggy Pop, The Beat, and Rachel Sweet. She has also directed the shooting of the first major-label videodisk effort,* Rock Justice, *a live theater rock operetta written by Marty Balin and Bob Heyman. In June 1980 she left to form her own company: VAMP (Video And Music Productions). Now based in Los Angeles, Kim has completed projects for Huey Lewis and the News, Randy Hansen, Donnie Iris, and The Fools.*

In this issue consulting editor Martin Polon begins a new column, entitled "Audio/Video Perspectives," which over the following months, will consider some of the talking points being raised, in particular, by the emergence of the music-video production.

AUDIO/VIDEO PERSPECTIVES

by **Martin Polon**

The professional audio industry has flourished despite, rather than with, the direct support of, the electronic visual entertainment — video, TV, film, etc. — community. Historically, sound pickup, reinforcement, recording, and reproduction has had to go it alone; augmenting the visual imagery handsomely, but as a separate entity.

The 1980s bring a decade of technological change so remarkable as to alter existing relationships between aural and visual media. Instead, a synergy of audio and video is marking all levels of electronic entertainment, from the home to the recording, film and television studios. This column is a tool to measure the combining or synergy of audio and video. It will provide a perspective on the directions that audio and video will take, both in the studio and for the home. Since the home entertainment marketplace dictates much, if not all, of the direction taken in the professional environment, that impact will have obvious significance to the audio/video professional.

In this column, we will track the progress of some fascinating dimensions to this audio/video synergy. Examples will include:

1) The Progress towards stereo sound for television broadcasting, both in terms of the current Japanese experience and the potential for adoption in the US. Also to be considered will be the implications for change in studio production, program recording and distribution, transmission and the ultimate reception in the home.

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AUDIO/VIDEO PERSPECTIVES — *Martin Polon*

(continued)

2) New technologies for stereo transmission of television audio superimposed as part of the video signal, both on nationwide coaxial cable and microwave, and as part of satellite transmitted video signals.

3) Provision of stereo signals for cable television viewing of theatrical motion pictures.

4) Use of the television signal to contain audio dimensional information, so that stereo TV sound could be true to the acoustical characteristics of the original location.; that is, a concert from Lincoln Center would provide information to automatically adjust an electronic delay, allowing rear speakers to provide the ambience of Lincoln Center in the home.

5) Difficulties and promise held forth for the audio and video industries by the videodisk (with its three conflicting formats), and/or the several formats for the digital audio disk, with the given of a home electronic entertainment center based on a video screen, keyboard, and set of transducers. The ultimate consumer need will be one disk player capable of providing stereo or multi-channel audio, video entertainment with audio, and computer software. The path to this or some other scenario will be a fascinating one to chart, since it controls growth on so many levels for the audio/video industry.

6) Growth of digital electronics to process, record, reproduce, and distribute audio and video signals will provide substantial areas for comment and observation. The current controversies regarding the size of the digital sample for audio may be heavily influenced by the impending application of digital video tape recording. The success of digital VTRs may provide a technology for multitrack digital audio.

7) Impact of stereo and multi-channel motion picture soundtracks, and the adoption of a single system for movie use, will be regularly examined. Motion pictures remain the primary software for home and theatrical entertainment, and the presence of a stereophonic soundtrack will greatly enhance film presentation on stereo TV, via stereo cable, and on stereo videodisk.

8) Techniques for creating new audio and video programming that best utilizes the new communications distribution technologies of video cassette, videodisk, multichannel cables, on-air subscription and pay TV, multi-point distribution systems, intermediate satellites, direct broadcast satellites, laser and fiber-optic systems.

What becomes apparent through all of the changes that mark the Eighties as different from the preceding decades, is

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equipment. I was an embarrassment to everyone; I kept asking who was going to develop the film, and the cameraman would just look at me with his mouth open, not knowing where to start. I built three visual environments in the building, by stealing the grills off all the light fixtures and hanging them from the ceiling. The result — fortunately — happened to look fabulous. After that, they let me do anything I wanted.

The point of all this banter is that there are some things which obviously you need to know about video in order to *do* it. And there are also some things that you don't need to know, but which may help you do it better. In this article I'm going to mix up information from those two categories.

Most people are aware that the primary purpose of the vast majority of video-music pieces is the promotion of an audio recording artist, and a current audio product. A record company becomes convinced that a video will be useful for intra-company hype. Invariably, they will consider a video production as a cheaper way of "touring" the artist, than underwriting a concert tour. Originally a novelty, such use of videos as ammunition for firing up the local promotion reps about a hot new act is quickly becoming standard operating procedure.

Other uses for these tapes have continued to develop, including Network and Cable Television airplay, performance at clubs, and videodisk reproduction. In all these cases, though, money to pay for the video comes from the record company. Most major record companies now have persons, usually in their "artist development" departments, whose main function is the generation and application of music-video pieces.

These positions are the germ of what will become the "Videodisk Business." In the past, their range of decision was fairly small, since most of the videos were just tapes of a band playing a song live in one location. With the advent of repeated performances, however, the awful sameness of the live format became apparent. Also, the video approach was widened to include acts that were not attractive and/or dynamic enough performers to have benefitted from a live tape. As the storylines and number of locations increased, the label rep and producer began to have complicated decisions to make regarding the best use of their video dollars.

SETTING THE BUDGET

The overall amount of the budget is the single biggest determinate of what kind of video gets shot. Live shooting, for instance, is nearly always cheaper, but there are right and wrong instances for live shooting. A record label may be tempted to use this approach because of its economy, and end up losing more than they save. If a good video can help a new band, a bad one can just as easily do it very serious damage. The label, of course, will tend to set a lower budget for a new band's video than they would for an established act. A new band may be more likely to have an "off" night in concert, and then the shoot will have been a waste of everybody's time.

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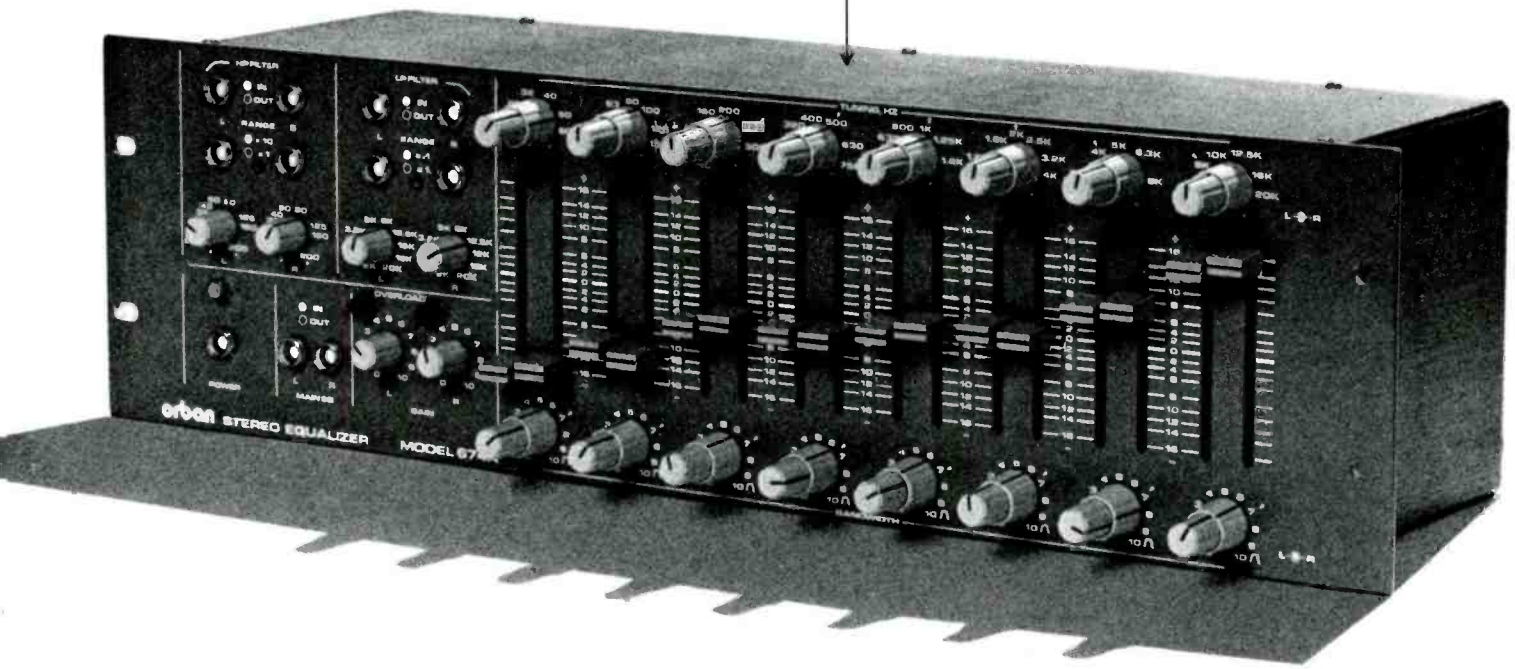

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AUDIO/VIDEO PERSPECTIVES — *Martin Polon*

(continued)

the need for the consumer to have certain capabilities in the electronic home. It has been suggested that this need is a function of the development of a services-oriented society, with work patterns shifting towards the home as a sort of "electronic cottage industry." While work at home may be part of the future, it is also apparent that the needs of the consumer to have maximum capability from electronic entertainment will exert equal force in shaping the future. This column will also provide perspective in evaluating the forces of standardization, regulation and the lack of it, alternative systems and competition, and piracy.

The only fly in this electronic ointment is the potential lack of agreement on the direction of technological development. The net effect of a lack of standardization will be to slow down all of the processes of change that will come about from the fusion of audio and video. The real danger for the entire electronic entertainment community is to allow intercine squabbles over technological advances to dominate the decade of the '80s.

A perfect example is the need for theatrical motion picture programming with stereo soundtracks. The advent of the stereo videodisk, coupled with the Japanese NHK stereo television experience, has created a new market for feature entertainment with stereo audio. Similarly, cable television systems, such as the Times-Mirror operations (or the ill-fated Premiere service), are beginning to deliver stereo sound with all of the pay features provided, even if the stereo has to be synthesized. Movie exhibitors are experiencing a 10% reduction in audience, and need a strong attraction like stereo to draw people into their theaters. The problem is caused by a motion picture industry that cannot decide on a system, from the alternatives offered by Dolby, Comtrak, and others.

The consumer electronic marketplace is similarly in flux, with no less than three different videodisk offerings from MCA-Phillips, RCA, and Matsushita (Panasonic/JVC); none of them compatible with each other.

There are more potential digital systems available than uses for the systems. The digital dilemma occurs at the professional audio recording level, in studio video, for home audio use in recording, and with the audio digital disk. In all, there are at least *15* different digital schemes being discussed in the audio/video business.

The ultimate financial prosperity and prospects of the professional and consumer audio/video industry depends upon consumer confidence, and expenditures for equipment and software to be used with that equipment. The audio consumer has become the *audio/video* consumer, but the memory of quadraphonics is still strong. Consumers want to buy a standard product that offers variations in features, but not in compatibility. The Philips audio cassette has become the foremost example of what standardization means. There are literally millions of machines and tapes in current use around the world, varying in quality from professional to toys for children. Similarly, the professional impact of the 1-inch C-format, helical scan VTR has been to establish a standard for reliability and quality that has mandated the use of this video format throughout the world.

One can only hope that the pressures for standardization are strong enough to override the confusions of multiplicity in the audio/video marketplace. Ultimately everyone is a consumer, whether at the professional or private level. The demands of the consuming marketplace will be for reliable compatible, products, and only standards can fulfill that need. □□□

Factors concerning the choice of indoor or outdoor shooting must be considered. Outdoor shooting is generally easier and cheaper, particularly because of not having to use lights, but of course there's less control. And, if it rains, you're out of luck.

The amount of time budgeted for a shoot is often more of a problem than the money, and the outdoor shoot will be limited by light. In a very real sense, the quality of the end product will be directly proportional to the size of the budget. Equiment, location and director's salary will be affected by the price. In their discussions of such factors, the label representative and producer may also discuss the possibility of shooting on film, and then transferring to video. This is an expensive option that I'll discuss in greater detail later on.

The budget will be sub-divided into pre-production, production (the "shoot") and post-production portions. I simply divide it in two, allowing 50% for pre-production and the shoot, and the remainder for post-production. The amount spent in pre-production is small: location fees, licenses and permits, insurance, and perhaps a few airfares.

A client will, of course, choose a producer based on the client's appreciation of past video productions. When shopping for a producer, a client should be certain that the tapes they see compare in some way to the available budget. If $12,000 or $15,000 dollars are available for one or two songs, it shouldn't be assumed that the client will end up with a product that looks like a tape made of one song for $70,000 or $100,000 dollars. Style, equipment, effect, and even the director's salary will be vastly different. Some companies neglect to inform the client that they will not be using the same director. It's a new field, and one hopes that such practices will be weeded out, along with their perpetrators, but it still happens today.

Having settled the purely budgetary matters, the client, director and producer will

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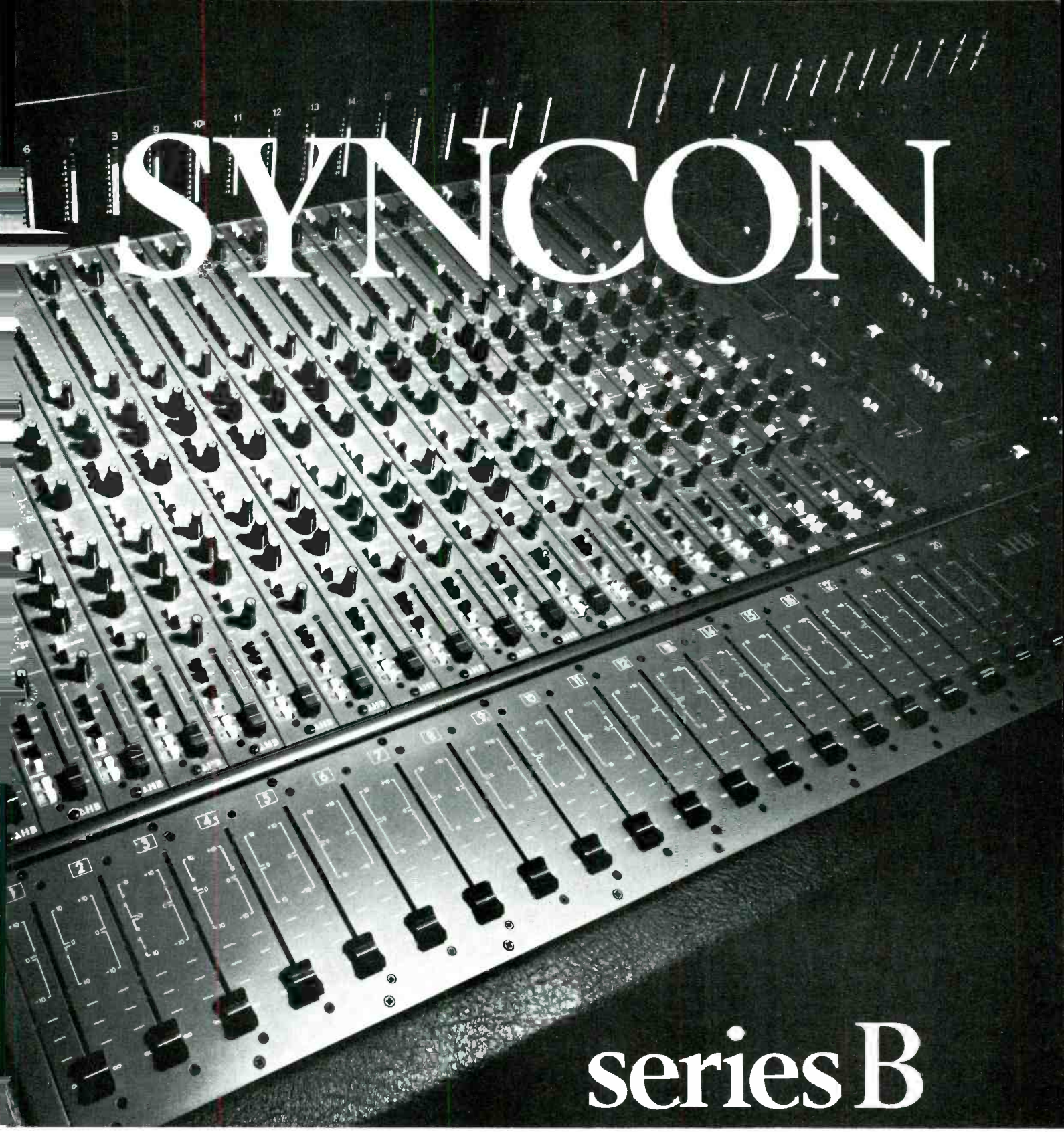

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. . . cameraman **Wes Dorman** . . . actress **B.J. McCallester** on the Donnie Iris shoot —

All photography by: ***Jay Heyneker***

want to move on to more creative considerations, and they'll probably do this in combination with the director. At VAMP, I happen to be the producer *and* the director, but they are different hats, and I'll discuss the differences at length in a moment. For now, let's discuss the content of the piece.

The first consideration will be the music's style, because this may dictate, to a certain extent, the demographic of the targeted audience. An overall visual image of the group is a consideration. If they are well-established, we may have to match the style of their live shows or album cover art. I always like it when I can be a part of establishing the visual image of a new group.

Aside from the image of the group itself, what is the song like? Is it a definite story line, or a live-action rave-up? These are usually not cut-and-dried categories, so there's a lot of discussion. The client will probably have a pretty strong objective in mind. But it's well to remember that every client will appreciate versatility in a video, for added mileage from his dollar. It is rather difficult to contrast artistic considerations with commercial ones when talking about a music-video piece. The breakdown sort of gets hazy when you are talking about one artform selling another.

It must fall to the producer and the director to discern as clearly as possible the limits set by the client, and his motives in seeking the services of this particular team. Obviously, it is desirable to avoid cliches, but the client may have a clear idea of what he wants to buy. For a long and happy career, it's to the advantage of the producer and the director to find out if he expects a billboard, or the Mona Lisa. If I can deliver a billboard *of* the Mona Lisa, all the better.

One consideration of growing importance is the concept of repeatability. Formerly, when a local promotion rep had seen the video once, he knew all that he needed to know. But with the increase in the number of these pieces for entertainment, it is crucial that they don't turn off the viewer after the first sitting.

DEFINING THE ROLES

I've already started to use titles for some of the people involved in a video-music project. These are in some cases synonymous with counterparts in the audio field, but in others they are not; some of them don't translate between the disciplines. For that reason, I'll spend a little time on the roles played by people who make the project happen.

The *PRODUCER* has primary responsibility in a video-music project. He usually solicits or accepts the job on behalf of his production company. Responsibility begins then and continues through to delivery of the finished video to the client. The producer may or may not be a creative member of the team, but he will certainly be charged with liaison between the client and the creative team. He must have an understanding of the budgetary requirements of his team, and the acumen to negotiate for a workable budget for the delivery of the project.

In some cases, a director or writer will submit an idea or a finished script to the producer, who will then solicit clients for it. One of the producer's toughest jobs is to ride herd over the creative team in a budgetary sense. This is, of course, especially difficult when the producer and director are one person, as in my case. It takes a very astute and diplomatic person to maintain not only his working relationship with all the interested parties on the project, but *their* relationships with one another. In some cases, a client will hire a producer directly, and ask that he procure the services of the creative team. His first call will be to a director.

The DIRECTOR fulfills the most demanding job on the creative team. In very many cases, he is also the writer, and the script is his most important product. Even if he works with other writers, the piece that finally emerges will be the product of his imagination and skill. The actual extent of this script depends on the style of the shoot (that is, live or storyline, etc.). I am a believer in a very fully realized script.

The Director also has the most extreme contact with the band. Generally he will memorize the songs to be shot, get as familiar as possible with the story, the parts, who

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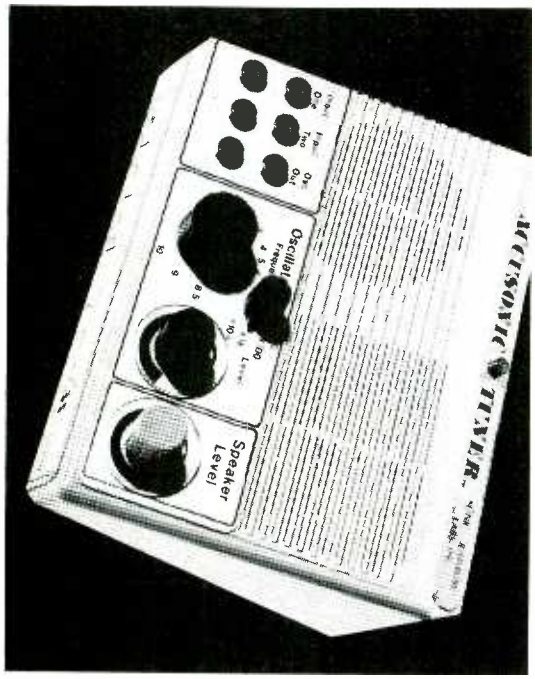

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plays what, who sings, and so on. Odd things (like how tall everybody is) become important in video, although obviously they play very little part in audio. I always try to see the band play the material live if possible. This part of the relationship between the director and the band is too often disallowed by the demands of time, and separate careers.

Many bands and managers fail to see the importance of spending time planning and discussing prior to the shoot. Imagine these same musicians meeting their album producer for the first time at the studio just before cutting the basic tracks! In fact, the director's function does correspond to the producer in an audio project.

Chances are that the director will have a script nearly completed when first he meets the band but, until they have discussed it, the script is at risk. Sometimes it is hard to avoid a somewhat defensive stance when first meeting a band. Bands, for their part, oftentimes tend to forget their own limits in the video field. This video director would never judge an album by looking over the liner notes or the track sheets. Directors must try to be open-minded, and consider the adaptability of the script to their particular style.

I keep a demo reel of my videos, and I always sit with the band early on and watch them. That way, the band gets an idea of who I am, and I can see what kinds of ideas and techniques they react to. This also allows me the luxury of beginning to educate the band about video without waiting for the actual shoot, where the high-priced gear and crew will be eating up the budget while we discuss make-up, or something equally trivial.

The director works with the producer at first then, as the project gets rolling, he handles logistic questions with a person known as the *ASSISTANT PRODUCER*. The AP's talents usually include a penchant for legwork, and a lot of connections; licenses, permits, location scouting, insurance fall to the Assistant Producer. Of course, he must be able to maintain a very solid rapport with both the producer and the director.

Like other forms of creative endeavor, a shoot can be real fun. But it will also be very hard work, and the choice of crew can be vital to the success of a shoot. The director will want to choose his own crew, without question beginning with the *CAMERAMAN*. The cameraman is, in fact, a sort of second director, and his position roughly translates to that of a really good first engineer in audio work. Thus, in the same way that if you get a bad engineer in audio the job is a lot tougher, a bad cameraman can make life very tedious. A good one, on the other hand, will make the shoot happen.

There is a tendency to think of the cameraman as a sort of "high-priced tripod." On the contrary, he is a highly skilled and extensively trained individual, who will probably have spent hundreds of hours getting his chops together for using Steadicam and other hand-held camera techniques, even beyond his technical training as a camera operator. My favorite cameraman, Wes Dorman, and I seem to lock into the same wavelength on a shoot. His characteristics, techniques, and even his sense of humor have become part of my vocabulary. As a result, when I sit down to write a script I may develop it according to what I know he'll shoot.

Beyond his eye, the cameraman must also have great endurance, both physically and emotionally. No one else works as hard, physically, on a shoot as does the cameraman. His patience must rival Job. Outsiders oftentimes view him as furniture, because part of his talent is to disappear and to become, in effect, his lens. In very many cases he provides the magic in a piece, and you can certainly never do without him.

Usually at some time prior to the shoot I will meet with a *LIGHTING DIRECTOR*. Obviously, lighting is crucial in video, not only in a purely mechanical, but also in an esthetic sense. In many cases the lighting director may effect my script, either by adding ideas or by vetoing or altering things I have written. On the shoot, the lighting director is responsible for setup of the lights and/or reflectors and, in combination with the cameraman, for the acceptability of the light range. A lighting director will be at the video

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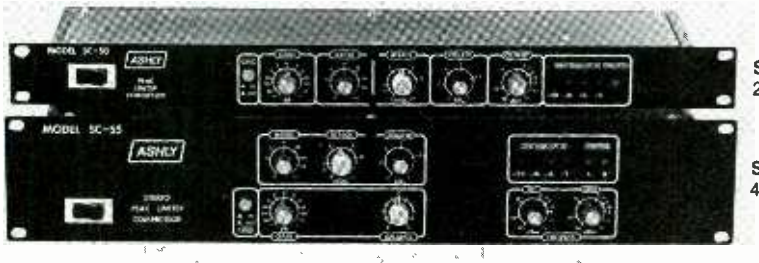

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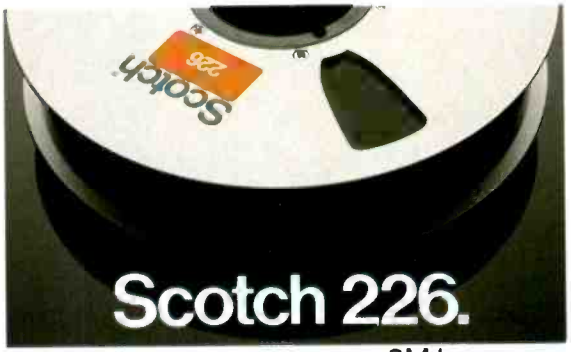

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monitor with the director, and will have the authority, even the responsibility, to stop the take if there is a problem with the lighting.

Commonly, we may get a shadow from a cameraman on a performer. Then I expect my lighting director to butt in and fix it. There will be a staff of production assistants around to move the lights, by my own favorite lighting directors are never afraid to pitch in and physically move lights if it helps. I'm sure most directors value this kind of team spirit, and it somehow seems to get translated on to the tape.

PRODUCTION ASSISTANTS, by the way, are like second engineers in audio. Many times they are entry-level positions, training for the more advanced technical jobs. I do ask, however, that production assistants be very serious about their current duties. Their personalities are also important, since they become, in effect, the audience during a shoot.

From the client's side, there will be several people at the shoot. I've already mentioned the label's video representative. Since in many cases they are responsible for the producer and the director being hired, reps are usually basically allied to the creative team. Some of them are directors themselves, and I find in general that they have a pretty good handle on video productions, and can be a big help. The band and their entourage, including manager and technical crew, are pretty much self-explanatory, as far as their roles go, and I'll deal with them in the next section.

THE SHOOT

I will arrive at the shoot wearing my director's hat and clutching my shooting script which, as mentioned earlier, will be pretty thorough. If we're to shoot a live performance, I'll have seen the band do the song before, and will be able to tell the cameraman what to expect. If it's a storyline piece, I'll have every line scripted and each shot outlined. Come what may, I intend to shoot that script. In fact, I'll probably shoot alternative shots to some of the scenes: possibly a long shot of the whole band, along with the closeup of the lead singer that I intend to use, which gives me a little room to play with the edit points if I get stuck later.

. . . scene . . . ***The Donnie Iris shoot*** . . . *the author in silhouette* —

(This would be like a record producer getting a couple of different vocals or solos, and alternating or selecting later in the mixdown.)

I will have the script color-coded by section for shots in different locations, different light conditions, and so forth. I will also have several copies of the script, so that I can make notes, additions or deletions easily. Later, the final copy will be a handy diary of my day's work to study. I said that I fully intend to shoot that script, and I meant it. This is not to imply that I'm not prepared for anything spontaneous happening on the shoot; on the contrary, I am ready for it. There is nothing better than good ad lib material when it works. Having my script in the can gives me the luxury of trying anything. Too often I've shot something that had us all in stitches at the shoot, and turned out to look really dumb later.

It's useful if I can now catch a few moments to get in the groove with my crew. Later I'll be spending most of my time and energy on the band. Since we've probably all worked together before as a crew, it will be a little easier to lock into the band later knowing these guys don't think I'm ignoring them. The crew's rapport with the band is important, too. It would be too easy for the crew to slip into inside jokes and lingo, which would set up the feeling of *us* and *you*. My crew knows this and they will include the band in the fun. They will also generate an overall feeling of calm, provided by their confidence in each other's abilities.

The director's control of the shoot's rapport will obviously be affected greatly by the ambience of the location. Just as in audio the producer's "through the glass" rapport with the artist is vital, so it is that the director must maintain good communication with the band at a shoot. If, for instance, we had just gotten a good take, but something was wrong with the lighting, it's not really necessary for the band to know that the lighting director is responsible for their misery. But it *is* important that they be aware that the reason for another take is because of technical rather than esthetic problems. Otherwise the band may get too conservative, or make changes in their performance which you don't want. Simply letting them know, "We need one more for us," will allow them the luxury of cursing the proper villains, and reinforce the repetition of a good take.

From the band's side, I hope they'll keep in mind the real purpose of the video. I have had band members repeatedly play tricks on me like not singing on a take, or doing something as differently as they can each time. When I can afford it, I love to have a continuity person around to watch for this kind of thing. Without such help, it's just possible that this guy could slip something past me. But considering that it will be *him* up there on the screen, it seems ridiculous to waste all of our time on trash like that. Actually, in most cases, extreme control of continuity is not something I personally care a great deal about. As a matter of taste, I prefer the freer feel of pieces which don't concern themselves with the location of chairs or exact duplication of camera angles, and so forth.

It's too often true that I meet the band's manager for the first time at the shoot. This is unfortunate because it sets up both of us for an adversary stance. The following statements are generalities, and there are certainly exceptions, but I'm laying them out because I'd like to avoid problems with managers in the future. The manager will quite often be a newcomer to video; he'll have

. . . with engineer ***Ken Kessie*** . . . at ***The Automatt,*** *San Francisco* —

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— ***multi-shot*** *and* ***dissolve***

—VIDEO EFFECTS—

soft edge sidewipe —

a lot of questions, and will be rightly concerned that a substantial portion of his client's promotion budget has been entrusted to this rather harried-looking individual with the clipboard.

Given, then, that their hearts are in the right place, and that their concerns are for the welfare of their clients, I'll only ask that managers exercise the same restraint that they undoubtedly use in the recording studio. I'd much prefer that we get a chance to sit and view some tapes together in advance, and to discuss our own shoot. That way, I feel confident that we can be of real help to each other and, more importantly, to our mutual client, the artist. As with so many other relationships this one can, and should, be worked out in advance of, and not *during*, the shoot. Problems at the shoot can only jeopardize the product and, incidentally, the artist.

FILM VERSUS VIDEOTAPE

This is as good a place any to get a little deeper into the differences between shooting on film and shooting on videotape. The biggest reason using film is that a much wider range of light conditions are acceptable. Film also looks *gorgeous*. The stock itself is costly, however, and lab costs for processing must be added as well. When working with film, usually the director will not have an on-site monitor for color viewing, which can be disconcerting. And, of course, he will not be able to view his day's work until the stock has been processed. This will tend to somewhat inhibit spontaneity. Undoubtedly the film will be transferred to video for final use, since tape playback systems are easier to come by, and the sound will be consistently better.

Once we've started to shoot, it would be really too bad if we had to interrupt for other things. It's *very* important for the band and their manager to understand this. Considering the cost and importance of the product, I find it hard to believe that some bands will leave to go shopping. Or that a manager will schedule press interviews in the middle of shoots. I find that many bands are not prepared for the amount of hard work that goes into a shoot. This is one reason that they may not schedule sufficient time for the production, and then when they get stuck on something, there's a tremendous pressure to finish it today. When that happens, we may all continue for too long, make mistakes, or worse, accept less than the best.

I learned about video production on gear that was obsolete even then, and frankly wouldn't trade that experience for anything. Granted, I would not now go back to using outmoded gear, but I sincerely feel that it was the necessity of working around the limitations of my equipment that gave me the gumption and insights to test the limits of myself in this medium. It would be just deadly for video creativity if we all accepted a salesman's interpretation of a designing engineer's idea of what his new gizmo can do. When we scratched through our mongrel assemblage of marginally operational apparatus, we were forced to come up with ways of using one piece of gear to do the job of another, or two others. We were also forced to stretch the capabilities of our equipment's dubious quality. Given that kind of spirited approach, I feel certain that a talented producer or director can set the salesman's head spinning with the possibilities of his doohickey.

Another extremely valuable insight from this type of education is the ability to cast your piece within the limits of its budget. Nothing fails worse than a cheap piece trying to look expensive. It's important to cast your dollars where they'll do the most good. Naturally, everybody loves the idea of being turned loose in Tiffany's. But Woolworths can be just as much fun, and sometimes more so. The reason I mention this at this point is because I'm going to tell you next about the expensive part:

POST-PRODUCTION

Now that I have transferred my filmed pieces on to tape, I'm ready to begin editing it and assembling the selected parts into a finished masterpiece. The rates for good editing facilities are pretty high, so I'll save every penny I can by doing extensive off-line editing. By dubbing my masters on to used tape and inserting "window-boxes" in the picture for time location, I can allow the band and label reps to preview my piece with me, always being careful that they understand where I'll be adding effects. This avoids the drummer deciding later that he doesn't like his profile in a shot, or the label rep canning the whole piece because the lead singer's pants were unzipped. It also gives me the opportunity to "sleep" on an edit; to see how it looks after a break. I like to watch an off-line edit with all the clients, making notes for my final edit points. Then, with the approval of my clients, I can go into the final edit with some confidence.

When I arrive at the editing facility, I'll have the services of an editor. This person will generally have no creative function on the project; his job is simply to execute the wishes of the director. Of course, any director worth his salt will accept creative input wherever he can get it. Since I also function as editor on an awful lot of video works, I'll at least give a listen to his comments or advice. After I've twice checked my numbers for the edit points, I'll type them into the computer that will run the edits. Each edit point will be based on the correct elapsed time from the previous edit. As a result, if one is off sync, it'll be passed on through the piece. Therefore I check each edit for correct synchronization as the final edit is made. In some cases, the editor and I will work everything out, and then the final edit will be made by a person called the *Conforming Editor*, who will correspond to the mastering or mixdown engineer in audio.

Post-Production special effects are added at this point, too. In general, I am in favor of writing as many effects or "tricks" into the production stages as possible. Aside from the creative challenges inherent in this approach, I find that it gives me a better handle on the whole piece if I've shot what I want. And, of course, the effects are much more expensive at full editing rates.

Special effects are an interesting subject; I love them and I hate them. Like audio special effects, they are more often misused than properly applied. Also, like audio, the director will be faced with mighty temptation when confronted by an editing facility chock-full of the latest digital effects generators. One can easily see the results of this temptation in a number of current video pieces. Tape after tape, we are treated to the same litany of effects: Freeze-frames, Slow-motion sequences, the so-called "Wipes," where one image sweeps across another (or, in the "O"-Wipe, spreads outward from a point to engulf the screen). They keep coming: Colorizations, Dissolves, Black and White sequences, and so on. Each of these can be riveting or heartbreaking in the proper place, but by the handful they remain boring.

At times boredom gives way to irritation. A director has in his lens one of the world's great animated rock performers. Hair flying, sweat spraying, this gorgeous animal leaps to the microphone, every vein pulsing, each muscle tense and poised for the climax. He's got me. I'm on the edge of my chair waiting for release . . . and the director FREEZES THE FRAME! As I turn off the set, I'm imagining the director's throat between my thumbs. The very same effect was used by the director of a piece for a New Wave artist, whose exaggerated mechanical movements were very much enhanced by the freeze-frame technique. The music was perfectly suited to the stop-and-go visuals, and I found it mesmerizing.

A very fine audio engineer once told me that the best thing about many recordings wasn't what was put *in*, but what was left out. It would seem to me that this adage translates perfectly to video.

THE FUTURE

The future of video-music production is a

— *continued overleaf . . .*

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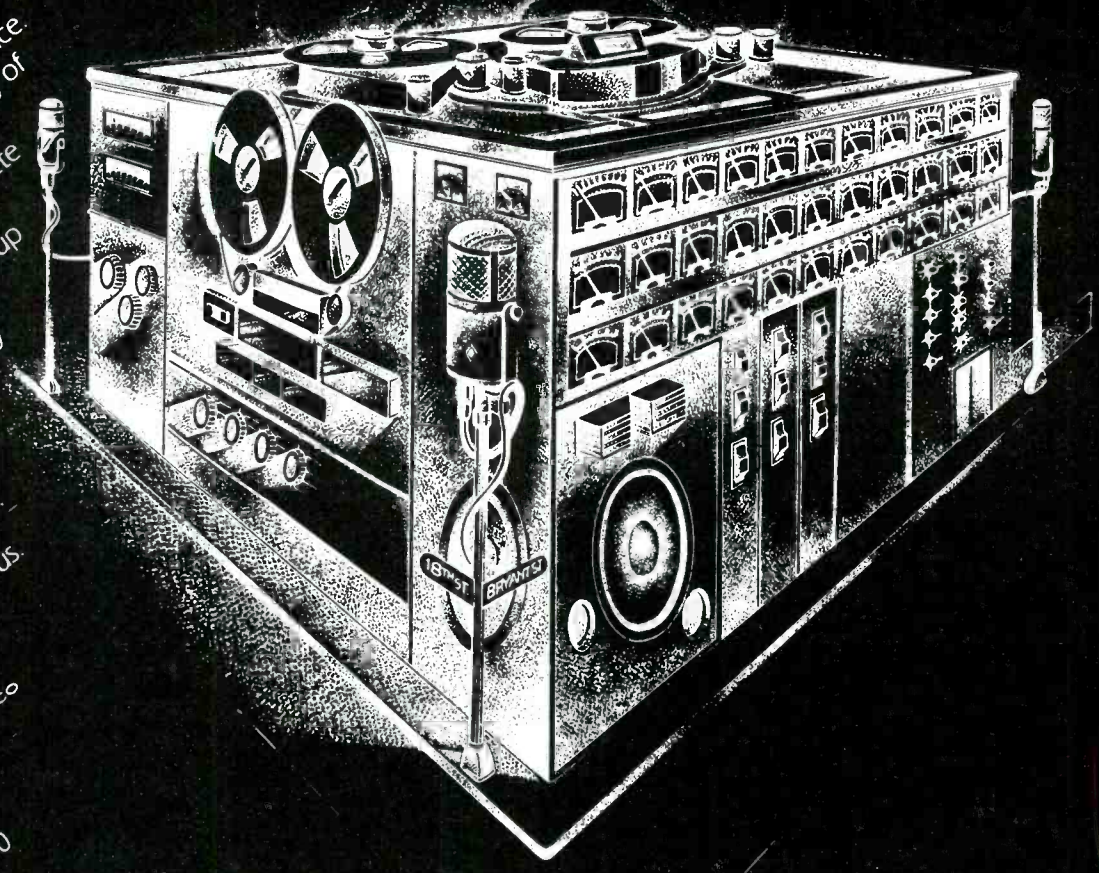

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— *two-way mirror*

—VIDEO EFFECTS—

'O' wipe —

tough subject on which to get a handle. By the time you decide what may happen, it's probably already happening, and something else is starting, too. That is part of the excitement of working in such a new medium. The growing popular appeal of video music is the medium's greatest strength, and will be the key to overcoming the hurdles which currently plague the field. The major inhibitions of video music at present are twofold, and they are both based on greed. I don't mean to oversimplify these problems, however. I am more than grateful that it is not my job to solve them, and yet they frustrate me and I believe they do a great disservice to the creators and consumers of video music.

The first of these inhibitions is the lack of some basic agreement for the payment of musicians, through their unions, for performances of music videos on commercial television shows. I will not say that current union demands can, or should, be met. Nor do I believe that there should be no payment whatever to the musicians. If a music piece is aired at a stage when the band has an audio recording with an active sales pattern, then it would appear that the artist receives valuable promotion of the recording, in exchange for use of the video as entertainment. If the network is selling airtime for a lot of money, then it should follow that the audience is large, and the artist is gaining exposure to that audience. It is currently true that many fine video-music pieces are not aired because of this problem, thus doing damage to the record company, artist and video creators. In effect, there is a heavy lid on a vast area of potential video music expansion.

The second inhibition is the lack of agreement for a compatible videodisk format. Again, the problem is complicated, and proponents of each system have a great deal at stake. But the fact remains that the majority of potential consumers are going to hold off their purchases until they can be assured of some compatibility between systems. Creators of video are becoming increasingly impatient with the battle over formats. The announcement at a recent large video convention that there would be a cocktail party one evening to unveil a major breakthrough in the videodisk field set the whole arena buzzing. After a whole day of the most giddy speculation and anticipation, the introduction of yet *another* variant format was greeted by well-deserved derision from the assembly. Luckily for the hotel staff, there was no rotten fruit at hand.

My own feeling is that the home videodisk market is the most fertile area for expansion of the video field. Once the decision on format is made, the market will explode. In spite of the fact that the consumer may not have the capability to reproduce them, they will buy videodisks because they are the most durable storage mode for video. In all probability, the final format will be such that the disks themselves will last indefinitely with proper usage. The Fans will do a lot more trading and lending among themselves — which probably won't make the manufacturers too happy — but compatibility is a *must* for the development of any market at all, so they'll have to accept it.

The products themselves will probably take the form of storyline musicals, like operas. This will make them listenable when the fan doesn't feel like sitting down to watch, and maintain repeatability in the storyline. There may be disks in the style of current television shows, with three or four bands in concert, and maybe even slick radio-style hit parade presentations.

Record companies are seeing the impact of their video campaigns, and I think they'll very quickly expand from the current wave of pop and rock pieces to other styles of music.

In the past jazz and country music have been largely represented by "live"-style pieces. I think both forms are ripe for a more creative approach. Country music is certainly a candidate for the storyline format, and jazz a natural for more abstract techniques and experimental animation. B.O.S. (or Black-Oriented Singles) is another field of music that has been somewhat stifled by the insistence on live-type video. I sense a pendulum swing of popular appeal for the storyline format. At a recent conference, a represenative of a network television show, who had taken the floor to insist that his show would review only live-style pieces, was roundly booed by assembled creators.

I think the writers and directors have tested their wings, and will be bound no longer to the documentary format; nor will audiences sit still for it. Which raises some other future plans. Video clubs already exist, and many nightspots use large-screen video as a part of their entertainment. As people get used to the idea of dancing to video, the club scene will take off. Rental libraries, some with playback facilities also available for rent, are sure to crop up. Sorry about that, Manufacturers!

The connection between video production companies and audio facilities is also growing daily. Until very recently, my office was located at The Automatt, a very fine automated multitrack recording complex. I think we both benefited from this close proximity. For example, our working relationship gave me access to the studios for shoots. On the other hand, I think it would be deadly to just shoot every piece in the same environment, and The Automatt certainly had nothing to gain by placing any restrictions on studio clients using other video companies. The fact remains that more and more audio facilities are forming some type of alliance with video producers, and some of these are on a very "in-house" basis. Personally I would find that a little inhibiting, and I think the studio would, too. So, for us, the looser symbiotic relationship works better.

I know of one band that obtained its recording deal with a major label by using a video demo, which is a really good idea for a new band. If it already has an audio demo, a band can probaby find some hungry producer who will shoot a video to the track. The band should remember to retain control of the tape in some way, and to be very selective about what the record company sees. When the budget is tiny, the band will have to work harder and be more cautious. Audio can be *very* bad on low-rent video gear.

I've got one favorite fantasy for the future of video music in the home: a technology that will allow the viewer to be selective in the show's program content. If the production were taped using many cameras and angles, and this information stored on multitrack medium (this would probably have to be tape), the viewer could then mix the program the way he or she wanted to see it. If you have a crush on the drummer this week, you can watch his every grimace and twitch. Your kid sister would *die* for the guitar player? She gets to watch his whole act. This will remove the passive attitude of the viewer and, in the long run, add to the interest span of the piece.

From the creator's standpoint, it will be a fabulous innovation: imagine being able to shoot every piece in five or six different ways! With the addition of special effects capabilities on a home playback system, the viewer would get very close to being the director of a show. If you can imagine these tapes being interfaced with animation software for the home computer, giving the viewer a vocabulary of characters and action variants, you've got millions of little Disneys in the living rooms of America. And big Disneys, too, of course. In terms of technology, all this is not too far away. Microchips will make it all very cheap and accessible.

At VAMP, we view the combination of video and music as a marriage made in heaven, as our name implies. Those of us who intend to practice in the field will need to profit from the accumulated knowledge of each other's discipline. I hope that this article has shed a little light on the subject of video for some of you in the audio business, and that our cooperation can hasten the development of some of the many future possibilities for video-music production. □

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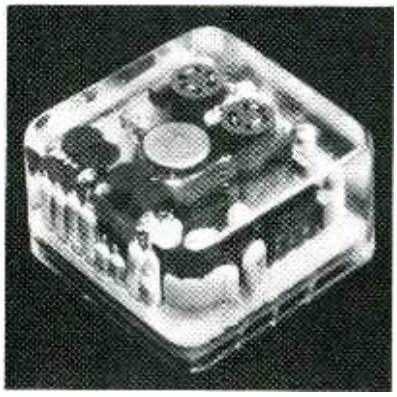

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Laundramat sketch . . . director Bill Dear, cameraman Michael Murphy

. . . an on-location Video Record Shoot with Michael Nesmith's Pacific Arts Video Record Company

by Robert Carr

All photography: Joe Gough/Crystal Photographics

The Eighties are promising the advent of video product becoming available for private, in-home use, and the flourishing of cable networks offering a potential of 30, 40 or more separate channels. However, with so many windows of exposure, the seemingly vast reservoir of movies, sporting and news events, music concerts, and such will rapidly become exhausted. Luckily, the inspiration for novel and refreshing software, as well as the drive of media pioneers to experiment and create with state-of-the-art technologies, has already given birth to a hybrid, yet potentially all-new industry — the audio/video production company.

The foundation of any new industry is a divergence of ideas and concepts. Multifarious innovations are healthy and should be encouraged, but only to the point where there exists a survival-of-the-fittest situation, with at least some competitors thriving to enjoy their well-deserved success. Taken to the extreme, the lack of standardization can herald a quick and painful (translated: costly) death, as in the case of quad sound.

On the other hand, the wide-ranging approaches to software formats give hope to producers and consumers alike, freeing all involved to explore the creative spectrum from the ultra-conservative to the most bizarre. Regardless of one's preference, the market place is big enough, and young enough, for every participant to partake of his or her own fair share, without over concern for stylistic guidelines and monetary boundaries.

One man with clear and definite visions as he looks toward the future is Michael Nesmith. So positive is he of the direction to be taken by the audio/video marriage that his Pacific Arts label, headquartered in Carmel, California, has ceased all phonograph record manufacturing to become — exclusively — a video record label. The name of the company is now Pacific Arts Video Records.

The first release under the company's new banner was a 30-minute comedic piece entitled *An Evening with Sir William Martin*, starring Bill Martin, followed by Nesmith's

"Video records . . . they're the hardware remnant of a psychological shift in the thinking of the world about television. It's not like some add-on like power-steering, air-conditioning, power-brakes . . . it's not like stereo was to hi-fi . . . it represents a fundamental shift in the way people think . . . to the $5,000 — $10,000 home entertainment center . . . the result of man's desire to control his environment . . ." — Micheal Nesmith

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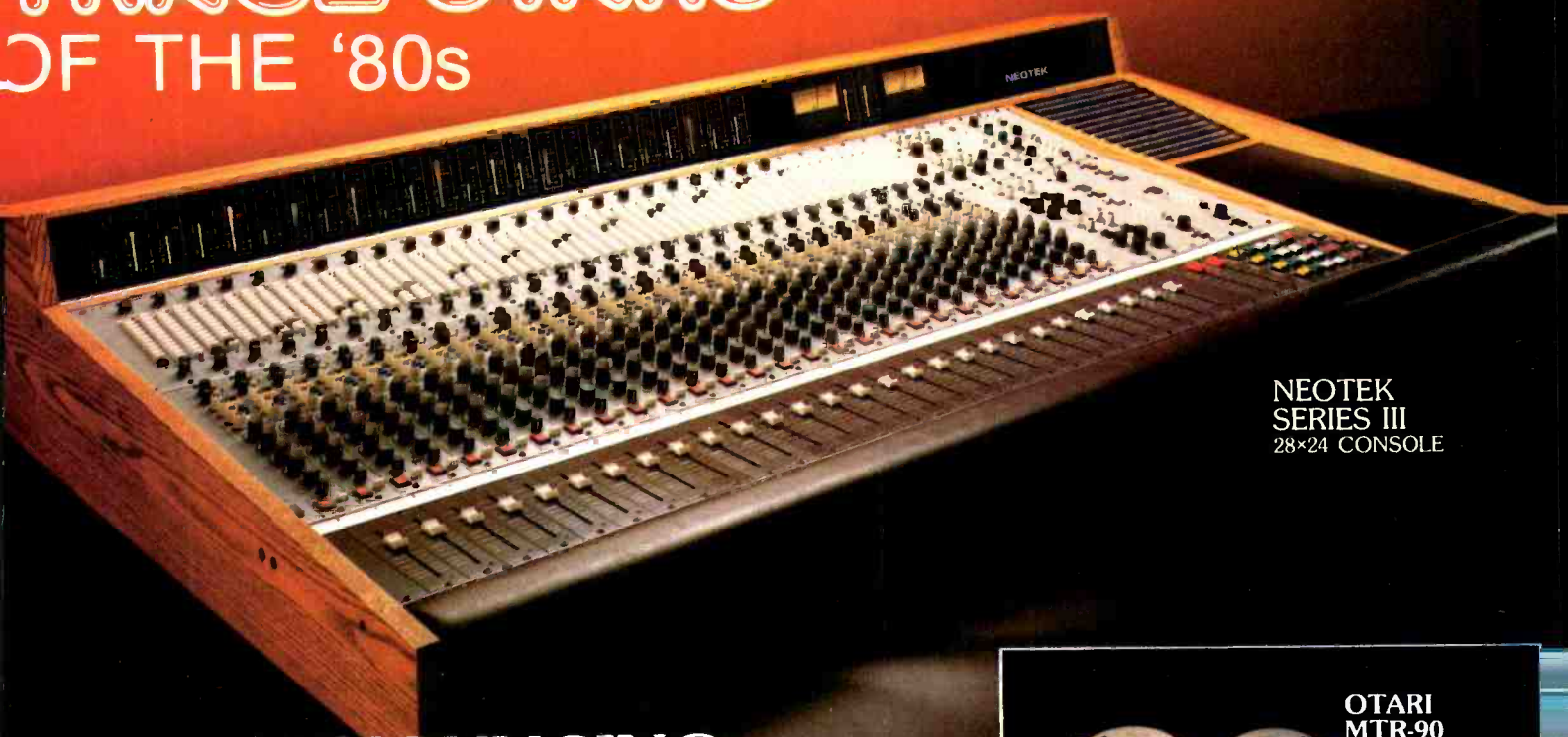

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AUDIO/VIDEO RECORDING

. . . the Pacific Arts SHOOT

own music-comedy-dance video record, called *Elephant Parts*. Soon Pacific Arts will begin production on a 90-minute action-adventure film with a heavy-metal soundtrack.

Already Michael Nesmith has had a great deal of success in Europe and Australia with a video accompaniment to his song "Rio," which appears on the audio LP *From A Radio Engine to the Photon Wing* (1977), and has produced video clips for Kim Carnes ("More Love"), Poco ("Under the Gun"), and Sean Tyla ("Breakfast in Marin"). In addition, through his Pacific Arts Television division, Nesmith supervised the production of *Pop Clips*, a Top-40 audio/video television show, for the Warner Amex Satellite Entertainment Corporation.

Presently this media maverick is finishing writing, producing, acting, and singing on his own one-hour (approximately) video, *Elephant Parts*. Some parts of the program offer a tongue-in-cheek focus on Prime Time TV. The piece is comprised of five song-videos, as well as short clips satirizing game shows, old movies, talk shows, and other familiar formats that can be found on an average night of television viewing. No one clip lasts longer than 4½ or 5 minutes; some are as short as 8 seconds. The philosophy behind the Nesmith video record is to not force the audience to glue themselves in one place for extended periods of time. Instead, the piece is designed to be watched from any point to any point, with a feeling of completion once the playback unit is shut off.

Michael Nesmith, actress Lark Gelb rehearse Mexican Restaurant scene with Director Bill Dear and crew.

In this early stage of home video, movies seem to be the most popular seller — perhaps more out of habit and familiarity with the format than anything else. But how many times can someone sit and watch 2 hours and 20 minutes of *Superman*, or any other movie, regardless of how well it's been made? *Elephant Parts* offers an alternative.

Every clip is written out, keeping random events to a minimum, although controlled spontaneity is frequently encouraged. Because Michael Nesmith and director Bill Dear do most of the writing, storyboarding is usually necessary only to convey the layout of a scene to a member of the crew. Bill does a shot list every evening; then he and the script girl work out the procedure for the day.

Pacific Arts has a crew of regulars on staff, which make for a solid working relationship among all the members. That bond translates into a trademark of quality on every piece they turn out. Within the confines of their budget, the crew takes great care to make certain that make-up, sets, costumes, action and sound are as near perfect as possible. They have no alternative. Consumers are used to quality in multi-million dollar motion pictures and television mini-series. There is a minimum standard for excellence that must be surpassed if made-for-home video is to succeed.

THE VIDEO PRODUCER

Unfortunately, the video shoot is a mystery to not just a large percentage of audio recording professionals, but to anyone who has not had the privilege of experiencing the excitement and the intricacies involved in seeing such an endeavor come to life. Compared to an audio session, working in a visual medium necessitates a substantial crew. Most jobs are without comparison in the record business, and those positions with similar titles are not necessarily analogous. Co-producer Kathryn Nesmith sheds some light on her responsibilities at Pacific Arts:

"Basically I just try to monitor everything coming together. We have a general idea of when we want to release a piece of product, and I work backward from there. In this case my husband is the artist and co-writer with director Bill Dear. We'll sit down and talk

. . . continued overleaf —

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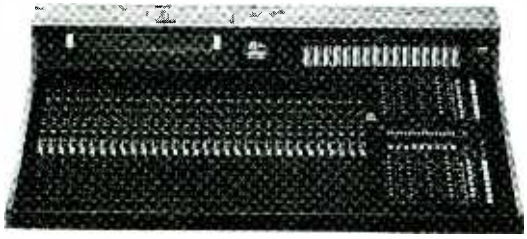
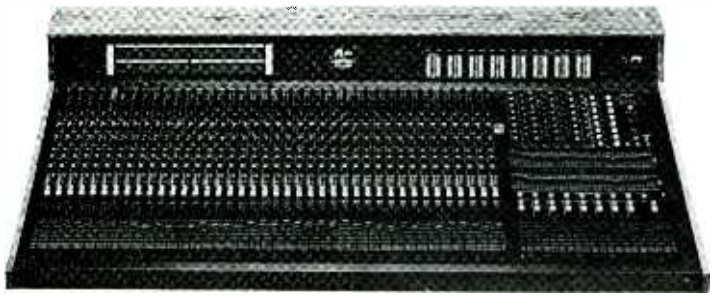


SC32-16 STAGE CONSOLE



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about the bits to be used — what kind of things they're thinking of doing. I'll find out how long it will take them to write the material, and then start preparing from there. I'll break it down from the standpoint of what is involved to shoot it. Are there any major props that we need? Are we going to shoot at the soundstage or on location? Will we use film or video tape? From there I'll do a budget and hire the crew."

R-e/p: So your capacity is more in the business sense rather than the case of an audio producer, who would also be concerned with the creative aspects?

Kathryn Nesmith: Each producer works differently, I think. There are producers that are more nuts and bolts producers, and those that are more creatively involved. My tendency has been more towards the nuts and bolts, because the creative aspect is really covered. If there's something I don't think is funny, or if something doesn't work, I'm not the least bit shy to say what I feel. We have a good, open relationship that way.

Michael Nesmith: "Should video records be repeatable? Video . . . it requires you to sit there and pay attention . . . similar to sitting down and reading a book . . . A book is generally not repeatable more than twice!"

R-e/p: How involved is the pre-production process?

KN: It's very easy. The first thing I do is get the script. What I like to do is think it through myself. After a while you get an idea of how long it will take to shoot it. Is this a day shoot or a night shoot? How many setups does this require? Can we do this in one day? How is the director; does he work fast or slow? What variables will hold us up?

You figure out the number of days, sit down with the budget form, and just fill it in. There are spaces to list what equipment is needed, how many days, cost per day, and so on. You work out talent and crew costs the same way. The trick is to think of yourself on the set, and to work through everything. Can we shoot this on location for $150 rather than building a set for $1,500? The script calls for two people; that's okay. I need a dog; do I need a trainer, or will any dog do to just walk through? You figure when you'll do things and where. This shot we'll do outside. What if it rains? Well, then I can move this other scene inside, and move this here. That's the hardest part. Once I've got the times figured out, I sit down with the director, and check it with him. Usually the director will tell you it'll take a shorter time than it really will!

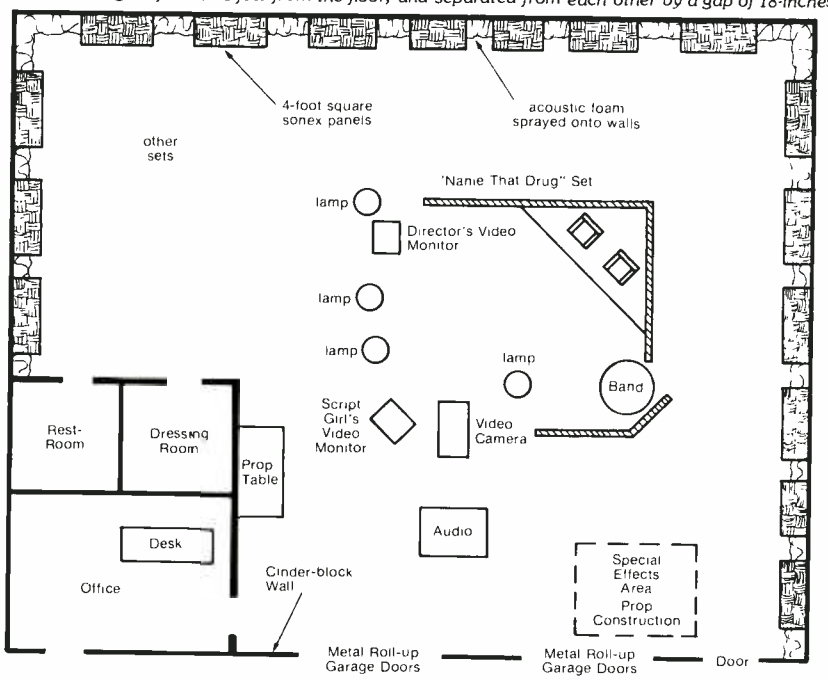
R-e/p: Is your role basically finished once all that is under control?

KN: Oh, no. We have all these people, and I have to keep pushing them along. The director will ask, "Do you have that shot?," and I'll say, "that was good; let's go on." I have to continue to do that, because when we're on the set, the director is going to tell me what he needs — another shot? — and so on.

Michael was telling me the other day that we're just like the people in a little studio in Memphis in 1955 — working out of a garage making rock and roll records. How much experience do you need? None. It's open, that's what is so wonderful about it. Everybody is creative, and you're not locked out from the standpoint of experience here, because everyone is starting at square one. You *don't* need to invest a fortune to be competitive.

. . . *continued overleaf* —

Room Layout for* Name That Drug *Set: *The 4-foot squares of Sonex acoustic foam are attached to the walls at a height of about 6-feet from the floor, and separated from each other by a gap of 18-inches.*



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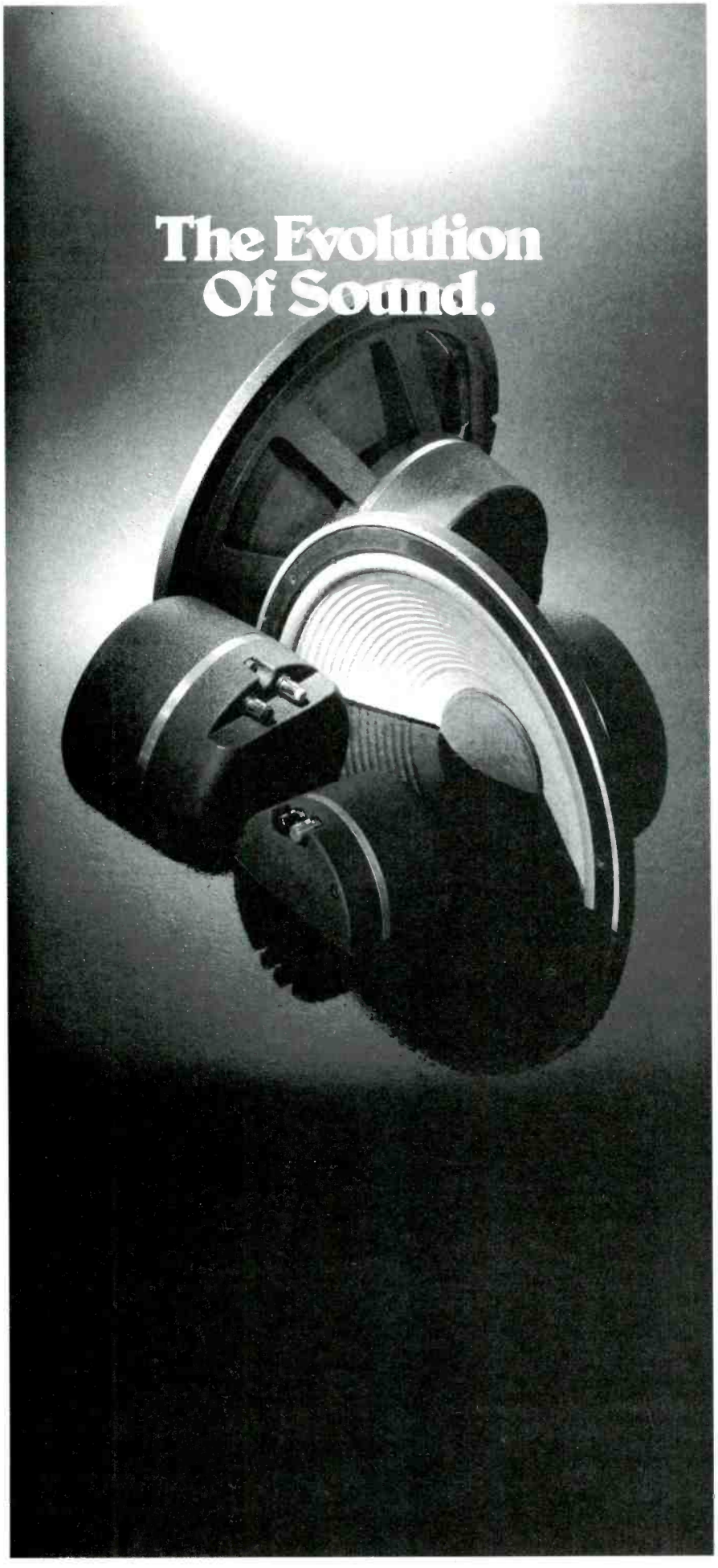

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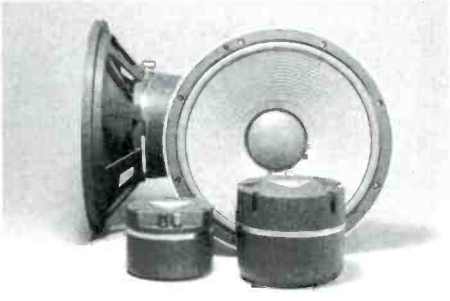

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AUDIO/VIDEO RECORDING

. . . the Pacific Arts SHOOT

R-e/p: Back in the 1930s and '40s, the major movie studios had a stable of actors and actresses under contract, and they would cast them in the studio productions as they were needed. Many of those artists were groomed, and developed by the studio. Do you see that happening with Pacific Arts?. . . taking raw talent and grooming them to work in the visual medium?

KN: You have two questions there. One was are we going to work with raw talent and groom them? And the other was how are we going to work with them? Actor Bill Martin and Michael are both signed to video contracts. They are video artists, in the same way someone would be a recording artist. They are exclusive to us as video artists, but they are not exclusive for other things. They can act in other projects, but not on video records — unless they act as bit players, and give Pacific Arts a courtesy credit like that which would appear on a record album.

R-e/p: Do you foresee yourselves getting into a position where you'll take someone and groom them specifically for video, and eventually sign them for all rights?

KN: Absolutely — someone in whom we see a particular potential. It's a similar situation to what happened when talkies replaced silent films. Not everybody can make the transition, and not everybody understands it. People are always calling Michael and asking him to make clips for them, because they feel he has the best understanding as an artist in terms of what the video business is all about.

We have taken it beyond promotional clips to sell a record album. Now we actually make the clip as the art work itself, and expand that into a form that is comfortable with people's habits and needs. Michael is understanding now that making clips for other artists is not going to be valuable to them. What is valuable to them is teaching them how to write visually as well as musically. To really be a video artist, people have to understand the medium, and expand their thoughts to accommodate it.

EQUIPMENT

Although stories abound about the exploding video business, that success isn't commonplace yet except in specialized areas. One pitfall that should be avoided pertains to committing vast sums of money to top-of-the-line gear, and then having to hustle clients to meet the monthly payments. Companies — specifically recording studios — who are not certain of the technical and creative aspects of the business are best advised to rent professional services until such time that a video (or film) division is economically feasible.

Pacific Arts carries the overhead on equipment it thinks it will use the most — a portable 16 mm Eclair camera from France, a complete set of lights, grip equipment and so on. They chose the 16-mm format because the comparatively small size of the television screens on which their product will be viewed does not require 35 mm for sharpness and clarity. A new process that scans the film negative and transfers the image to tape yields excellent quality videos for distribution.

The scene being shot dictates whether the medium to record the event will be film or tape. A stylized parody of an old Bogart classic was shot on very grainy, black and white film to add to the authenticity. The clips being done the day I visited the set were television programs — a game show entitled *Name That Drug*, and *Battered Wives*, a talk show — that would achieve a genuine look only if they were captured on video tape. Contrary to popular belief, 16 mm with processing is cost comparable to tape, if close attention is focused on planning and preparation.

Since Michael Nesmith's company doesn't often use taping equipment, they enlisted the services of One Pass Video, based in San Francisco. Diane Skuse from One Pass, was the technical director for the shoot. The regular crew handled everything else.

The video truck is powered by two 110 V lines — one for the air conditioning and the second for the electronic hardware. Two-way communication between the soundstage (sound engineer, cameraman and assistant director) and the mobile unit was via a Clear-Com CS200K intercom system.

The primary piece of gear is a Sony BVH-1000 1-inch video recorder also equipped with two audio plus a cue track. The Sony is a true high-band model (a method of recording that utilizes very high-frequency response characteristics of 5 to 8 MHz), designed specifically for broadcast applications.

Supplementary equipment includes:

Gray Time Code Generator laying SMPTE code track on channel three of the Sony video tape recorder;

Broadcast Synchronizing Generator TSG 3000 G1; and

TKP 45 camera control unit that usually contains color-processing circuitry, camera output plugs, and adjustments for setting the camera to suit the prevailing lighting conditions.

The camera used on the set is a Ikegami MA-79 — more of an ENG (electronic newsgathering) camera than a studio model. The Model 79 is very sensitive — video cameras have a lot of trouble handling contrasts — and quiet in operation.

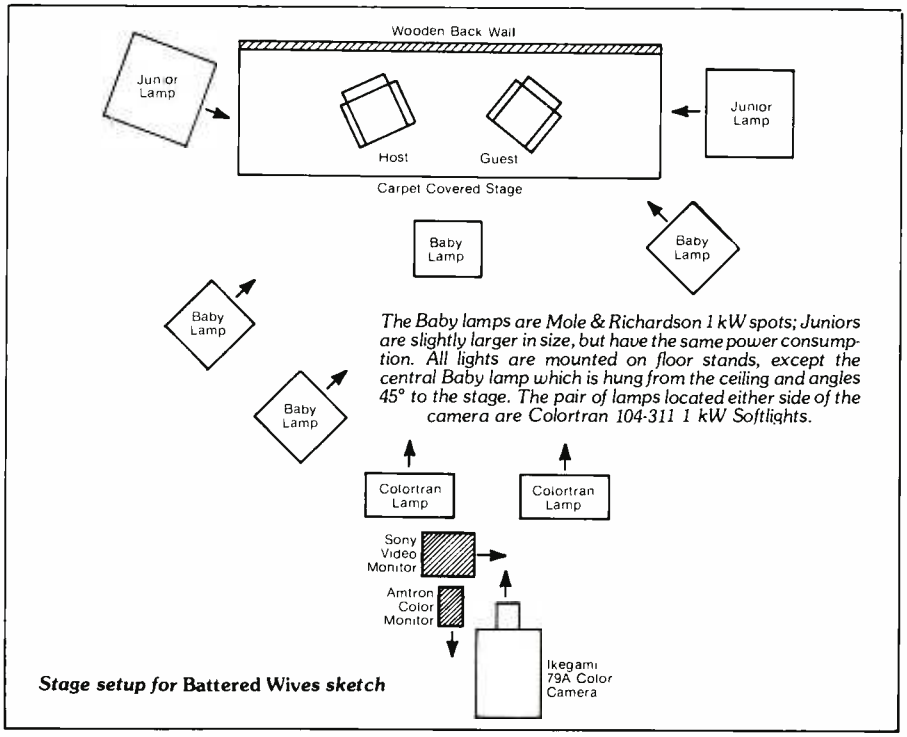
Once the gear is ready to go, the technical director stays in the truck monitoring all the electronic functions, in much the same way that the recording engineer approaches a live concert date.

Off-line editing is the norm regardless of the method employed to shoot the pieces, and is done out of house at either Vidtronics in Los Angeles, or One Pass. Utilizing the off-line procedure is more flexible and immediate, by eliminating the long waits necessary for the opticals to return from the lab and other time consuming processes.

CAMERAMEN/LIGHTING

Cameramen, obviously, operate the camera, but not so obvious is the fact that several men work on one camera at once. The Director tells the director of photography what he wants. The DP then interprets that idea to the camera operator as well as to the lighting people. In a feature motion picture, the director of photography and camera operator may be separate people; usually it's the same man (or woman). The assistant cameraman will keep the slate up to date by advancing the take number with every shot, so that the post-production editors know which piece of film to look for in the final edit. The assistant will also control the zoom in and out, while the operator's responsibility is to move the camera up and down or right and left. Finally, another person is given the task of driving the camera dolly forward, backward, left, and/or right.

The lighting crew may sound like they have



The Baby lamps are Mole & Richardson 1 kW spots; Juniors are slightly larger in size, but have the same power consumption. All lights are mounted on floor stands, except the central Baby lamp which is hung from the ceiling and angles 45° to the stage. The pair of lamps located either side of the camera are Colortran 104-311 1 kW Softlights.

Stage setup for* Battered Wives *sketch

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AUDIO/VIDEO RECORDING

. . . the Pacific Arts

SHOOT

an easy time, but obtaining the correct effects is a subtle art. The larger the light source (for example, a Colortran Softlite), the softer the light coming from it, and the softer the shadow. These are called fill lights. Small, directed sources, called Fresnels, can beget very harsh, sharp shadows. These are key lights and provide the main illumination of the subject. Fresnel spots come in Baby, Junior, and Senior sizes, and all are equipped with "barn doors" — door-like metal sheets that can be opened or closed to control the amount of light that gets to the stage. Screen-like devices called "nets" are often positioned between the source and subject to soften, harden, or direct the light. Lighting angles, intensities, colors, combinations, and contrasts are all "tools" of the lighting director's trade.

SOUND

Sound recording for this type of production is not nearly as complicated as that involved in recording a live concert. Nevertheless, film sound has a way of generating its own perplexing complications.

Any music recording is done in an audio recording studio in the traditional manner. The video portion is shot as the music is played through monitors on the set and, in some cases, just mouthing the words in the tempo of the tune, but without the music, is sufficient.

Jim Mansen is a free-lance sound engineer who has worked primarily in film, television commercials, and documentaries.

"The songs have to be pre-recorded," he feels, "because consumers are accustomed to hearing music the way they know it — especially if it's a hit of any kind. They really object to having somebody play and not have the sound the way it should sound. Even if it doesn't seem feasible to them for the band to be playing where they're actually playing. Dialogue during the sketches and other links is recorded on the set."

R-e/p: How do you deal with on-location acoustics?

Jim Mansen: Those acoustics are something you can be very concerned about, but you can also push it to the point where you won't get hired for the next job. If I had six guys here who were just concerned with adjusting acoustical panels to make the stage sound right every time we rolled sound, they would have to be standing alongside the 20 guys who are already here trying to do lights, props, sets, and so on. The cost per hour would be so high they would say, "No way."

I have to try for directional microphones to help concentrate on the sounds I'm trying to record. I'm trying to cut the environmental sound down so that I can get as clean a track as possible. Because of time and money limitations, I'm only allowed to do things like cover the broad, open areas of the floor with blankets, or hopefully have the wall treated so it's not a hard-line surface. The rest of it becomes mike placement, and encouraging people doing the acting to be loud enough to overcome the background noise.

It's not at all a technical accomplishment; it's a matter of compromising. A recording engineer has to compromise with acoustics all the time when he records a group live, but in film or video the picture becomes almost more important than the sound. Certainly if you talk with cameramen, they'll tell you that the picture is important, and the sound can be added later if need be. In Europe they don't record any sound at all on the stage. They just cue track the whole thing, and add the sound later. They don't even try, because it's very hard to get a quiet set in Europe.

R-e/p: When you're setting up to record the sound at a particular location, is there anything that you have to take into consideration, other than what we've already discussed?

JM: This job isn't all necessarily to do with the way it sounds, it also has to do with the way it looks. We did a shot on Highway 1 the other day. The background is a big plant, and we were filming a funny little skit about Detroit and a car company. We were on the opposite side of the road from the action, because there were all kinds of traffic going by. You'll see all the traffic in the video, and your mind will say, "Oh, that's a car going by." If we had gone to the other side of the road with the actors, the cars behind us would not have been seen by the camera. The mind of the viewer would object to the fact that here's this guy standing out in the middle of who knows where, and all of this car noise is on the soundtrack. By simply shooting across the highway, the sight of the cars whizzing by justifies the sounds of the traffic being on the tape. I have to be as much of an artist in interpreting those things as the cameraman."

* * * *

Compared to what music engineers are used to working with, the audio equipment requirements for recording a video clip on the set is minimal. Jim Mansen was using an Invictus mixing panel — six-in, one-out — made by Jim Bosco in Los Angeles. Videos are done a take at a time — very similar to music overdubbing — and then spliced together in the editing room. Three or four people is generally the limit to the number of separate speaking parts at any given time. Where, for example, 30 actors and actresses are employed for one scene, a wide shot of the entire group dilutes the potency of the action when one person speaks (except in the rare instance of an establishing shot), or confuses the action if too many speak. Close-ups of the individuals are what is most effective, and that means one microphone at a time.

Choice of microphones is determined by the situation. The best option is the mike attached to a "fishpole" (a small hand-held pole) or a boom, and the mike hard-wired to the mixing panel. This results in the best sound quality, but an extra crew member is needed to keep the mike in front of the subject and close enough to pick up what is being said, yet far enough away to be out of view of the camera. Lavalier microphones and VHF/UHF radio mike transmitters are the least conspicuous, the least efficient, and always a compromise. A microphone against someone's chest is not the optimum position to pick up the sound coming out of his or her mouth, and clothing noise often inhibits the quality of the signal. For a one-man sound crew, however, lavaliers are really the only answer when a lot of subject movement is involved.

The mikes in use at the shoot I visited were linked to the control board via a Micron 101, a two-part radio system comprised of a VHF FM 100 milliwatt transmitter, and a high-quality receiver that interfaces with any standard input on a recorder, PA or audio reinforcement system. The English-made unit attaches to the belt in the small of the back or fits in the actor's pocket, and is not intended for high signal strength. The FCC limits the amount of power a transmitter can radiate if it is on all the time. The range is line-of-sight. Doubling the power wouldn't necessarily double the range, but it would increase the power consumption and reduce battery life.

There are two primary drawbacks to all radio mikes. Any obstruction in the path between the transmitter and receiver becomes a major interference in the sound. It manifests as a buzz or a click on the track,

. . . director **Bill Dear** . . . cameraman **Michael Murphy**

Typical Audio Cue Log Sheet

SOUND REPORT

ROLL # SHEET #

DATE: TAPE SPEED:

COMPANY:

PRODUCTION:

LOCATION:

MICROPHONES TYPE	NO	RECORDER #
		CREW:

NEW TAPE ☐ REC TAPE ☐

SCENE #	TK.	FOOT.	STOP	REMARKS

PRINT CIRCLED TAKES ONLY

TRANSFER DEPT. ONLY

DATE:

TRANSFER MAN:

REPRODUCER #: RECORDER #

EQUALIZATION	LO	HI
PGM. EQ.		@
FILTER		

HEADTONE V.I. READING— (BEFORE EQUALIZATION)

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and is a direct result of low-level signal strength. A signal that reflects off a wall and arrives at the receiver out-of-phase with the direct signal is called multi-path interference. Both effects are common. They can be minimized on occasion, but usually not totally eliminated.

The audio recording unit for the video shoot was the VTR, but Mansen retained his normal setup. The line-out of the mixing panel ran into the Nagra portable recorder, and the output from that ¼-inch machine fed the video truck.

"It's lucky I did it that way," Mansen says of the first shoot of the day, "because this morning we had a matching problem on the first take that we didn't catch. The equalization came out thinner than we would really have liked. Michael did it so well — so fast — that it was over so quickly. It would have been very tough to ask him to set it all up and do it again. However, the sound can be dealt with in post-production. They can go to the ¼-inch tape, and transfer it all, because it ran in sync. It's all 60 Hz; it's repeatable, and it will lay down on the video tape exactly if you take the trouble to lay it down.

In order to keep track of the amount of footage each scene requires, Jim Mansen uses a form that would serve for several different departments. The form has places for all of the pertinent information on the top: Roll #, Date, Tape Speed, Company Name, Name of the Production, Location, Technician's Name, and Recorder #. The Scene # heading is self-explanatory. TK indicates the number of the take for the scene being shot, but instead of listing them vertically, they are written 1, 2, 3, 4, etc., across the sheet. The takes that are good — the ones to be kept and copied — are circled. A sub-audible slate tone recorded before each take enables the transfer person to simply count the number of beeps, and know from which point to start copying.

Many times a scene will be delayed in the middle of shooting for a day, a week or longer for any number of reasons. In order to maintain consistency of sound, a space is supplied to list the microphone name and number.

Each sheet is filled-out in triplicate. The sound engineer keeps one for the duration of the shoot, the editorial staff files one, and the sound transfer people have the last copy.

THE CREW

The crew, as Jim Mansen mentioned, numbers about 20 people, a small group by most standards. The breakdown of individual jobs is like this:

Executive Producer
Producer
Director
Production Coordinator
Production Manager
Assistant Director
Script Supervisor
Production Designer
Cameraman
Assistant Cameraman
Three Grips
Sound Engineer
Props Supervisor
Wardrobe
Make-up
Construction
Set Decorator
Unit Manager
Production Typist

This list doesn't include actors, actresses, caterers, pilot, and office staff. It's plain to see why major motion pictures so easily run over budget. Accurate and efficient planning and scheduling are absolutely essential prerequisites for success when undertaking such a venture. One or two inaccurate calculations can send salaries and rental costs skyrocketing through the roof.

Pacific Arts was scheduled to shoot from March 2 through 21, based on the fact that Michael and Director Bill Dear would complete an additional skit and two more songs, which was not the case by March 9. March 10 was then the final day of shooting for four days, to allow for the creative energies to catch up with shooting. The crew would be released for that time and, when work started again, the number of crew members would be reduced to accommodate the needs of what still had to be filmed.

The unions have so far been locked out by Catch 22. Consumer video production is, at this point, such a tiny operation that any attempt to unionize the participants would literally wipe out the business, thus robbing union members of a lucrative source of income within the next decade and beyond. Considering the present cut-backs in film production and the number of film people currently unemployed, survival and growth of this cottage industry into a multi-billion dollar goliath should be of paramount importance to all concerned.

Pacific Arts owns all rights to their product on a "buy-out" basis. The costs that go into making the feature are recoupable once the pieces are sold. For other visual product there are varying avenues open — the networks, cable companies, movie theaters — but Pacific Arts' success, and the success of anyone else entering the home video marketplace, depends on consumer sales. That condition doesn't allow the luxury of budgets capable of supporting the expenditures that unions require. At the present time, it's a "wait-and-see" attitude all around.

THE DIRECTOR

Bill Dear, director and co-writer, is one of the prime movers behind Pacific Arts Video Records. He feels that the home video demand will really boom when "the big video screens come easily into the homes. The Advents and projection TVs aren't good enough and accessible yet, because of the $2,000 . . . $3,000 price tag.

"In the Bogart-style bit we did, I shot it like you were watching an old movie. I used a lot wider shots than I normally use for television. I wanted to print the illusion that you were watching an old film. The whole bit is a sucker punch, so I wanted the audience to be taken in totally that it was an old movie. But with TV I shoot things a little closer. When the screens get bigger, I can shoot a little more

— ***Michael Nesmith*** . . . *rehearsing between takes* . . .

like real movies.

"I watched a movie on TV once that I had missed in the theaters — a western with Robert Duvall about the James Gang, called *The Great Northfield, Minnesota Raid.* It was a very authentic piece, but these little 6-inch horses came galloping up on the screen. It was very disappointing. I'm waiting for the big screens to get into the homes. I hope it doesn't kill the motion picture theater, because they both have a place.

"Home video is a real convenience thing, and it allows you to re-watch specific pieces, but there is a certain event that takes place when you go to a theater, because you are with an audience. It's seeing a comedy or a scary movie with a full house, and you can't get that kind of energy at home right now. We try to anticipate the big screen coming, but also shoot for the 90% of viewers who are going to enjoy it on small screens."

R-e/p: How are you approaching this idea of multiple or repeated viewability?

BD: We design these video projects to be rewatched. I don't know if you saw *Rio* or *Cruisin'*, but what we built into those was a rewatchable quality. That's the one thing that video has to do to really compete with the audio record. You can sit and listen to the same album more than one time. That's why you buy albums. A piece like *Star Wars* or *The Empire Strikes Back* is really engaging, and has a lot of detail.

We try to do that with these video pieces. If you watch one of our pieces four, six, ten times — whatever — hopefully by the tenth or eleventh time there is something else you didn't see. It's another piece of production value.

R-e/p: So it's important to have layers of action — almost like several stories going on all at once in order to keep drawing the viewer in?

BD: Yeah, stories that supplement the main theme or the visual, so the viewer doesn't get everything the first time through. We do that, because we're making it for home video. We want a little more there. Once the viewer knows the action and his eyes start to wander, he'll see a few extra things.

The best thing you can incorporate is people. We can put little objects in, but if we start to build people in that don't detract from what we are trying to do — add to it in a very subtle way — that's better. Almost everybody we work with here is more than happy to have me say, "Okay, go into make-

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up real quick, and do this. Stand over there." If they don't have a specific job like pushing a dolly, or rolling the focus, everybody is up for it.

R-e/p: Everybody's a ham on the set. That's great. Kathryn Nesmith mentioned that you don't shoot much video tape. Why is that?
BD: We are shooting video today, because the bits we are parodying today are being video taped. Otherwise, we don't like to shoot video. Personally, I don't like the look of it. Film has such a dimension between the viewer and the film. I don't know what it is, but if you put the same thing on tape, that magic isn't there; tape is like you are watching it live. I saw a piece of news once where somebody was threatening a judge. They had a shotgun wired around his neck — it was probably six hours after the thing happened, and it all came out for the good. Because the story was on tape, it was like I was watching it live; there was an incredible tension as I watched. Tape has its place — Johnny Carson Shows, game shows, news; it's incredible for news, but not when you're telling a fantasy story. We want to create a place where you can get to through this medium. And that's on film.

R-e/p: Are you approaching home video as an extension of the audio record, or is the video an end in itself?
BD: It's both. There is a certain quality that the television has as a light source in your room; or a cartoon has in a theater. You don't see many cartoons anymore, but those old cartoons where something would happen, and there would be a big explosion, car crash, or whatever. When you're watching a cartoon, look at the walls during one of those explosions. The theater goes through this strange light trip — all these strange animated light flashes. We try to build into the video pieces a different quality of light.

Home video is an extension of the audio medium, in one sense, so it has to have the quality to engage you without you having to give it all your attention. That's why music is so popular and works so well. You can do so many things while you're listening to music. Video has to do that so it gives you the picture when you look at it; it gives you the music when you look away, but it can also give you a feeling of light.

* * * *

The availabilty of wide-screen projection systems in the home will be a major step forward for the acceptance of original home software, but close-ups will require that make-up be the caliber of that in major motion pictures. Video is less sensitive to light and detail than is film, therefore make-up for video must be heavier, and very similar to that used for stage plays in order to get the same effect that a lighter application would yield on film. The abundance of light needed for video tends to wash out the complexions of the actors and actresses. The grain of the television picture limits the amount of detail possible. Under those conditions, thin, delicate film make-up disappears.

THE ARTIST

Michael Nesmith spent most of the day of my visit to the videoset preparing himself for the part of a narcotics agent he would portray in the *Name That Drug* sequence.

"I like to do them with as much substance as I can, otherwise they turn into little skits. If we do them real broad and slapstick, we don't have any of the subtleties. It's layers of subtleties that make it interesting, and funny.

"There are a lot of really strange conceptions going around in the artistic community about the content of the video record. Actually, it's pretty simple. For one thing, you're outside the tryanny of the plot, and that gives you a certain amount of ability to move. You can put images on the screen that are non-linear, or non-sequitur — that only have meaning just for the images that they are. The bits don't have to connect, nor is it necessary for the images to move."

R-e/p: You mean like presenting a painting or a print on the screen?
Michael Nesmith: If you want a painting, yeah. Another thing is that there is a definite interest in watching interesting people perform. If you experienced the Beatle phenomenon, or the Presley phenomenon, or Frank Sinatra, you realize there is a certain thirst that grows sociologically to see these people. If a Beatle record in the initial stage was visual — just them playing — that would have been very satisfying. But it does depend on the people involved. A visual of Fleetwood Mac or Blondie doesn't have that same kind of impact. We are probably not going to see that type of social phenomena again for another decade — until the medium gets established and everything really works.

It's expensive, but it isn't a complex or difficult art form, and most of the classical rules apply. You don't have to get involved in some sort of strange notion that it has got to repeat a thousand times. Video is *not* a phenomena like sitting down and listening to a record. It's similar to sitting down and reading a book. When I read a book, short stories, a book of jokes, it demands a certain stillness on my part. A record doesn't.

The audio portion is, of course, nothing but an audio phonograph record. But with the visuals married to it, it then requires you to sit there and pay attention. Most people are probably not going to want to do that more than three or four times, which is plenty of repeatability. A book is generally not repeatable more than twice, unless it's very complex.

R-e/p: Do you see there being a need to develop a new breed of variety entertainer to work in this medium, or is it possible — and more feasible — to work with established rock and rollers?
MN: Well, it's not preclusive of that, but because someone is a well established rock and roll entertainer doesn't mean that they are going to transfer into this medium. You know, a common analogy is that it is the same thing that sound was to silent pictures. That analogy is not quite complete, but it is the conventional wisdom. It requires generating a skill and a discipline that is not presently found in either rock and roll records or filmmaking; it's an altogether unique discipline, so it will take a different type of person. The best guess is to figure that they'll come from that medium.

R-e/p: Do you think visually now when you compose music?
MN: Completely. It's actually the same process, I'm just constructing on a different size canvas with a different palette. I have an entire range in hue of colors; the spectrum is broader. The application of images is different. Certain ideas are no longer interesting to me as an artist unless they are visually provocative. Now the visions are all very spiritual, meaning not necessarily portrayable visions. That makes it difficult to degrade, because I don't want to water the art down to form but, by the same token, it allows me, in some instances, to elevate a very mundane concept by expressing it visually. I think we'll see Abstracts, Expressionists, and Cubists. These are all analogous words, but similarly applicable in this type of medium.

R-e/p: The sky is the limit. You see video records becoming an art form just as music, art, dance, or poetry are art forms?
MN: It is probably one of the most profound, creative elements to come along. It's the hardware remnant of a psychological shift in the thinking of the world about television. It is not some add-on to a market item like power steering, power brakes, or air-conditioning. It's not like stereo was to hi-fi; it represents a fundamental psychological shift in the way people think — a medium of immense potential.

I read a report the other day that stated there is a shift perceived in the spending pattern of the consumer in relation to durable goods — moving from the automobile to what will be the home entertainment center, which will probably cost anywhere from $5,000 to $10,000. It's a result of man's desire to control his environment. That's all the automobile is — an effort to control the environment, and make it a beneficient environment.

R-e/p: But television stimulates only two of our senses — sight and sound.
MN: But that sight and sound culminates in an emotional impact. Ultimately we're dealing with the ability to think, so we're not just dealing with some sort of stimulation. The second important point is the relationship of the individual to the "Boob Tube" is much different than the relationship of the individual to his environment, because the environment is programmable. In essence, we're going to get back what we want — not what we're fed. That's a big difference, because of the dominion exercised there. It's a philosophical discussion; is it more beneficial to take a walk in the wood on a peaceful Sunday afternoon, or sit and watch a totally planned environment?"

Given enough time, Pacific Arts Video Records may well solve this sylvan paradox ahead of everybody else. □□□

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'SMPTE' The Fusion Force For Audio And Video

by Frank Serafine

Technilogical advancements are a continual occurence in the evolution of audio production for film, video and multi-media presentations. What has often been a somewhat strained working relationship between these fields, due to the advantages and disadvantages of the different media and formats with which they work, is at last coming to easier terms. Finally, a method of tying together the hardware of the different industries has been developed; a single method of synchronizing all the various tape handling machines. 'SMPTE' is fast becoming the new noun in everybody's synchronization vocabulary.

SMPTE stands for the Society of Motion Picture and Television Engineers. This group is extremely influential in setting industry standards, and I think they have finally done their job. The SMPTE time code was developed as a means for indexing specific locations on a video tape, using an address identified in hours, minutes, seconds, and frames — 30 frames to the second. It is used widely for editing and logging, and also to facilitate synchronization of video machines. Within the video industry, SMPTE is *the* universally accepted time code, and has finally made inroads into the recording industry as well.

SMPTE code is a digital signal in which each frame has its own unique code. With a SMPTE generator/reader the code from an original master tape can be read and identically regenerated on to any "slave" tape, which can then be synchronized to an accuracy of 50 microsec. (Each frame is composed of 80 "bits" of information; in addition, most synchronizers utilize a 20 kHz phase-locked loop to further enhance the degree of lock accuracy.) Developments in the hardware used to generate and read this code, and to control the synchronization of a number of machines, have streamlined to a great degree the work of audio to video co-ordination.

In some of my recent work creating special sound effects for motion pictures, I worked with video transfers from the actual film; video seems to be replacing the Movieola as a medium for display in film production reference and viewing. Video's versatility as a reference medium enables smoother operation and increases creative flexibility in music and sound composition, through the use of SMPTE audio/video interlocking systems. However, there are many sound editors who still prefer to work directly with film in assembling the elements of a soundtrack, citing lack of physical contact with the materials and simplicity in adjusting a frame of film, as opposed to a frame of video tape. Each method offers advantages, and which one is used is simply the choice of the creators and technicians working on a particular project.

Electronic Cinema

Extensive use of SMPTE was an important aspect of creating, editing and mixing music and sound effects for my current work with Ron Hays Music Image on a video album, entitled *Odyssey*. Code tracks also played an important part for Francis Coppola's Zoetrope Studios special electronic storyboards, on a project called *Interface*, currently being produced by Paramount. In the case of the video album, the SMPTE signal was read from the 2-inch video master tape on to one track of a TEAC Tascam 85-16 1-inch 16-track, which was then used for the actual assembling and sweetening of the soundtrack.

In order to interface with the equipment at our final production facility, Pacific Video in Hollywood, California, tracks had to be transferred to an Ampex 24-track machine. In this process, the SMPTE signal from the TEAC 16-track was read by a SMPTE reader/generator, and then regenerated identically on to the 24-track tape. In our following step, these tracks were transferred yet again to a second Ampex 24-track; this allowed us to slide specific tracks — much as with 35 mm magnetic sprocket systems used in conventional film sound production — by specifying exact numbers of frames to advance or delay the track.

In addition, the SMPTE code was transferred to track four of an Ampex 4-track. Channels one and two if this tape had organic effects previously recorded on a portable Stellavox machine, which was then synchronized with the second 24-track and the effects transferred. Finally, some additional sound effects were transferred on the fly to the 24-track, which was then locked up with the original SMPTE signal on the 2-inch video master, and the final audio mix transferred directly.

For Zoetrope's *Interface*, mono dialogue was transferred from a ¾-inch video worktape, on to the 16-track machine. Pre-

the author —

***Frank Serafine** is a sound-image composer who has created synthesized special sound effects for such major film productions as* Star Trek — The Motion Picture, The Fog, *and others. His work in the commercial advertisement world includes many innovative spots, as well as film trailers for* The Final Conflict *and* Saturn 3.

From his early days producing multi-media shows for The Fiske Planetarium, Boulder, Colorado, and Disneyland, through his recent work on the Ron Hays' music-image video album, Odyssey, *Frank Serafine has been at the focal point of the various entertainment media. His current efforts towards more streamlined audio/video SMPTE interlock are proving extremely influential in the development of hardware and software for this expanding field.*

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recorded incidental music and organic sound effects were then rolled in on the fly from 2-track masters. Additional electronic music and special sounds were also tracked on the fly as the video rolled, in sync. The 16-track tape was then sub-grouped into dialogue (dry and processed); music and special synthesized sounds; and sound effects. The three sub-groups were each transferred on to individual ¾-inch video cassettes. Audio channels of these tapes were all later edited on a Sony off-line video editing system, and mixed directly on to the ¾-inch master workprint, which also served as the SMPTE master from which the three other tapes all received their SMPTE striping, via the reading/regenerating process. This technique as used on *Interface* is one of Coppola's major technical innovations. It's birth took place in some of his earlier films, such as *Apocalypse Now*. The process, called Electronic Storyboarding, will prove to be an aid in the same way that music demos are often essential in record production.

Pyramiding

SMPTE synchronization also offers powerful potential for the future of the recording industry. As record production becomes more complex, and the need for additional channels increases, SMPTE synchronization of multitrack machines becomes invaluable. I do most of my work at my own SFX Studio in Los Angeles, using a Tascam 85-16 16-track recorder, and TEAC Model 15 console modified by Suntronics of Upland, California. My entire studio is controlled and synchronized by BTX Systems hardware. For additional tracks, I use SMPTE interlocking, and a technique I refer to as Pryamiding.

I record audio on the first 14 tracks, and put a 59.94 Hz tone on track 15 for "resolving" the tape. This tone also acts as a buffer in case of spillage and bleed problems from the SMPTE signal recorded on track 16. I then produce a mono reference mix on a 2-channel machine, with the original SMPTE signal regenerated on to the second track. In this way, using the same track format as the first 16-track master, I create a second master. This process saves wear on the first master, and gives you an instant reference mix. For mixing, the SMPTE signal on the second multitrack master is slaved to the first using a pair of 85-16s; the machines are synchronized and mixed through a single board, thus providing 28 tracks of functional audio.

Delay Effects

SMPTE also offers interesting possibilities for signal processing. Unique delay sounds can be derived by the same sliding process used in the mixing procedure for audio-to-video editing. The original "dry" source is run from a 2-track master to one channel of a multitrack machine. The same signal can be run on to additional tracks, as many times as desired, with specific SMPTE delays; for example, track two at five frames delay, track three at 10 frames, and so on. The result is a series of finely controlled and edited multiple delays. Of course, having each individual delay on its own track creates numerous possibilities for additional signal processing of each track. I use a DeltaLab Acousticomputer™ DDL for multi-level special delays. The subtle application of such a device with the delays that comprise this particular sound can be quite effective.

Multi-track Dubbing

SMPTE also allows multi-track recording technology to be brought into the film-dubbing studio, enabling synchronization with 35 mm magnetic sprocket systems. This creates the ability to make use of the advantages of conventional audio recording methods, freeing one from the kind of restrictions that have traditionally bound film sound. Film scores can be created in any recording studio, brought into dubbing stages to be combined with film studio tape libraries, and then mixed in a theater-size environment with the proper equalization curves required for motion picture soundtracks. A mutually beneficial working partnership between film sound editors and audio engineers and producers is finally a reality.

Drop And Non-Drop Frame

In the early days of the development of color television, engineers ran into an intriguing problem. Sixty-Hz broadcast signals, it was discovered, would produce an entirely unacceptable signal when received and decoded because of elaborate Moire patterns and "beats" that occur. A different frequency would solve that problem, but it had to be one that conventional black and white sets could also decode and produce properly. The solution was to adopt an operating signal based on 59.94 Hz; a frequency far enough from 60 Hz to avoid the problems with color, but sufficiently close to not create problems with black and white.

With the advent of SMPTE time coding, however, another problem grew from this solution. Conventional electrical instruments running on 60 Hz current would run fast relative to video equipment operating in "color time," at 59.94 Hz. The result of this was the introduction of two formats of SMPTE operation: drop frame, and non-drop frame. Non-drop frame operates in this "color time." The SMPTE code runs sequentially, counting 30 frames per second. Because of its slower operation, the difference between 60 and 59.94 Hz means that in one hour of elapsed time, the code will actually read one hour *plus* 3 seconds and 18 frames. Drop frame mode compensates for this, by "loosing" two frames every minute, *except* on the 10-minute marks, which results in real or "clock" time operation. Both modes are used throughout the recording industry; therefore, it is important to know in advance which mode you are working with for proper video and audio synchronization.

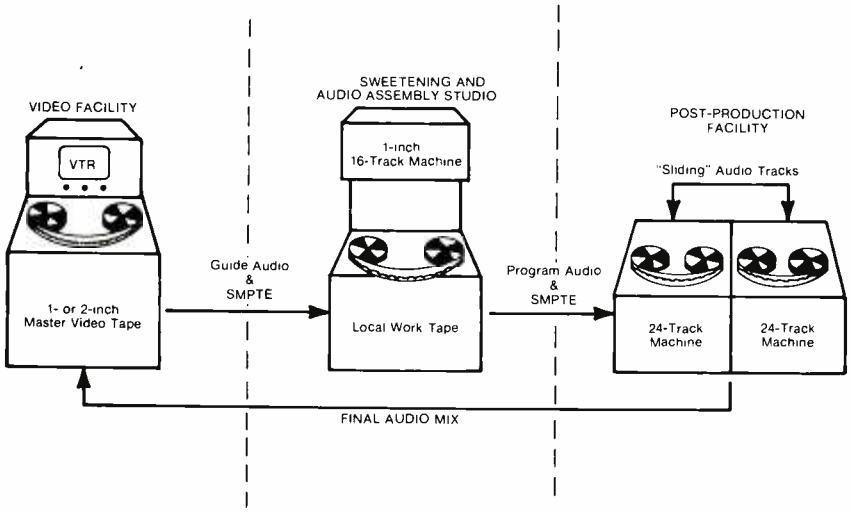
Interfacing and Interlock

Among the equipment currently in use for audio to video interlock, some grew out of the video industry, and others from the synchronization of audio multitrack machines. The most widely used synchronizing and control units used now are the BTX, Audio-Kinetics, Adam Smith and EECO. Within television and video production houses, the larger ones in New York and Los Angeles tend to use CMX and Gray Laboratories Systems, for control of 1- and 2-inch video master tape formats and simultaneous control of multitrack audio recorders.

The BTX control system that I use is comprised of a Model 4500 Synchronizer, and 4600 Keyboard Controller System. The Model 4500 is a microprocessor-based device for controlling the capstan motors of audio tape recorders, synchronizing them to an SMPTE signal from an outside source, usually a VTR. The Model 4600 Controller allows SMPTE-based control of audio recorder functions; accuracy down to 1/30th of a second for punch-ins and punch-outs becomes simple.

Upon introduction of what BTX terms its "Shadow System," intelligence and accuracy

Flow Diagram of SMPTE Codetrack from VTR Master to Subsequent Multitrack Audio Worktapes



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Electro-Voice's Greg Silsby talks about the Sentry 100 studio monitor

Production Studio, WRBR-FM, South Bend, Indiana.

In all the years I spent in broadcast and related studio production work, my greatest frustration was the fact that no manufacturer of loudspeaker systems seemed to know or care enough about the real needs of broadcasters to design a sensible monitor speaker system that was also sensibly priced.

Moving to the other side of the console presented a unique opportunity to change that and E-V was more than willing to listen. When I first described to Electro-Voice engineers what I knew the Sentry 100 had to be, I felt like the proverbial "kid in a candy store." I told them that size was critical. Because working space in the broadcast environment is often limited, the Sentry 100 had to fit in a standard 19" rack, and it had to fit *from the front, not the back*. However, the mounting hardware had to be a separate item so that broadcasters who don't want to rack mount it won't have to pay for the mounting.

The Sentry 100 also had to be very efficient as well as very accurate. It had to be designed so it could be driven to sound pressure levels a rock 'n roll D.J. could be happy with by the low output available from a console's internal monitor amplifier.

In the next breath I told them the Sentry 100 had to have a tweeter that wouldn't go up in smoke the first time someone accidentally shifted into fast forward with the tape heads engaged and the monitor amp on. This meant high-frequency power handling capability on the order of five times that of conventional high frequency drivers.

Not only did it have to have a 3-dB-down point of 45 Hz, but the Sentry 100's response had to extend to 18,000 Hz with no more than a 3-dB variation.

And, since it's just not practical in the real world for the engineer to be directly on-axis of the tweeter, the Sentry 100 must have a uniform polar response. The engineer has to be able to hear exactly the same sound 30° off-axis as he does directly in front of the system.

Since I still had the floor, I decided to go all out and cover the nuisance items and other minor requirements that, when added together, amounted to a major improvement in functional monitor design. I wanted the Sentry 100 equipped with a high-frequency control that offered boost as well as cut, and it had to be mounted on the front of the loudspeaker where it not only could be seen but was accessible with the grille on or off.

I also didn't feel broadcasters should have to pay for form at the expense of function, so the walnut hi-fi cabinet was out. The Sentry 100 had to be attractive, but another furniture-styled cabinet with a fancy polyester or die-cut foam grille wasn't the answer to the broadcast industry's real needs.

And for a close I told E-V's engineers that a studio had to be able to purchase the Sentry 100 for essentially the same money as the current best-selling monitor system.

That was well over a year ago. Since that time I've spent many months listening critically to a parade of darn good prototypes, shaking my head and watching some of the world's best speaker engineers disappear back into the lab to tweak and tune. And, I spent a lot of time on airplanes heading for places like Los Angeles, Grand Rapids, Charlotte and New York City with black boxes under my arm testing our designs on the ears of broadcast engineers.

The year was both frustrating yet enjoyable, not just for me but for Ray Newman and the other E-V engineers who were working on this project. At this year's NAB show it all turned out to be worth it. The Sentry 100's official rollout was universally accepted, and the pair of Sentry 100's at the Electro-Voice booth was complemented by another 20 Sentry 100's used by other manufacturers exhibiting their own products at the show.

What it all boiled down to when I first started the project was that I knew that the Sentry 100's most important characteristic had to be *sonic integrity*. I knew that if I wasn't happy, you wouldn't be happy. I'm happy.

Greg Silsby

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— CREATIVE USE OF SMPTE —

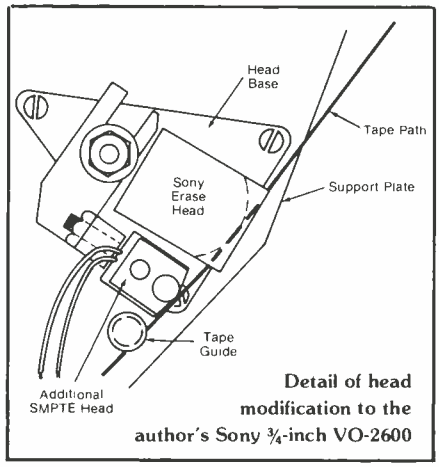
to within 1/100th of a frame (or 333 microsec.) become possible — precision to within 0.01 inches at 30 *ips!* My plans for the upgrading of this system include the installation of a BTX Model 5400 reader/generator, to provide direct processing of an existing code — whether on another audio or magnetic system, or a video tape — and the regeneration of that code on to multiple audio tapes. This will eanble assembly of soundtracks using live, on the fly sounds, pre-recorded scores, plus organic and processed effects.

My video playback machine is a Sony ¾-inch VO-2600 unit. In order to use this machine with SMPTE, some modifications were required: the addition of a special audio head, mounted on the chassis next to the standard erase head, used solely for recording and reading SMPTE code on the conventional cue track. However, such a modification creates a 90-frame difference between play and shuttle modes, which must be accounted for in the re-entry software program setting up pre-roll times and locations.

Telefunken has now introduced a three-track head, originally developed for television and radio which, as with the Sony VTR modification, comes with a special pre-amp circuit. This circuit and the additional track allows striping of SMPTE code straight on to the 2-track tape — via a track located between the pair of audio tracks — with no increase in crosstalk, and wide audio bandwidth. Stellavox has recently made available a similar head for its own SP-8 portable tape machine, which means that SMPTE striping can be carried out during location recording.

Sound Composition

As a sound image-composer, I find the future possibilities offered by interfacing with SMPTE the hardware I use in my



Detail of head modification to the author's Sony ¾-inch VO-2600

composition to be the direction most inviting exploratio. Small home computers, such as the Apple II, Commadore PET, Radio Shack TRS-80, and others, offer control capabilities of great accuracy and flexibility. A computer interfaced with my SMPTE controller enables instant logging of cues and specific tape locations. In collaboration with Ron Barker of BTX Corporation, I have been developing a storage program that will allow all the edits to be recalled at any point, and reformatted.

Advancements in digital sound synthesis and processing have offered powerful tools to the creative composer. The digital synthesizer will prove to be one of the most significant developments in the field of music and sound effects for films, television and video. Interfacing these instruments with other SMPTE-controlled devices thus becomes an important step.

Work is currently underway with Adrian Wood of Fairlight in Australia on future developments of the company's Computer Musical Instrument (CMI). The Fairlight can produce sounds using several methods of waveform generation and processing, or by digitizing and storing external source signals. This particular capability is one of its strongest features, offering the storage and pitch variation (via a keyboard) of any organic, or real, sound.

When coupled with SMPTE synchronization, the implications for the creative expansion of sound effects are enormous: creation and manipulation of a seemingly infinite variety of sounds, cued via SMPTE, producing an ease of operation never before encountered in audio-video scoring.

Digital Sound Storage

One example of this kind of digital instrument designed specifically for the motion picture and television industries is the Access Computer. The Access is a sound-storage library that can hold several thousand individual sounds at once, and provides immediate access to any of them. Its storage medium is hard disk; each disk can store individual effects up to two minutes in length, or one continuous 40-minute sound, such as a piece of music. Information loading is through analog-to-digital converters, so most often the sound is pre-recorded on conventional recording systems before being fed into memory. Direct input of digital recording may become possible in the near future, however. At present, the Access has an 8 kHz bandwidth, and most of the information stored in it has been drawn from old motion picture sound libraries and 2-track masters. What is needed is the updating of this catalog with sounds from the new generation of sound creators, and sound-producing devices such as digital and analog synthesizers.

Digital recording has its place in this field as well. The aging effects libraries currently in use should be stored in digital form before further degeneration takes place.

The Roland MicroComposer is a digital sequencer with the ability to edit, log and store sequencing patterns for control of analog synthesis. It can function as a control center for up to eight analog synthesizers simultaneously, using numerical values to determine pitch, rhythm tempo and compositional structure controlled from a 10-key, touch-pad keyboard. Compositions can be loaded directly from any 1 V per octave analog synthesizer controller, such as an external keyboard or pitch-to-voltage converter. With full synchronization capability and an up and coming SMPTE interface, the MicroComposer represents a major step forward for increased control of analog synthesis sound and music scoring.

SMPTE techniques will be of aid in coping with survival problems facing the audio and video industries in the future. Material costs, such as oxides, film and video software, and personnel and production costs, are becoming increasingly difficult for studios to manage adequately. Budget cutting is now a way of life, even for major productions; learning how to maximize "product" with minimum expenditure is the style at the largest studios today. Less people can produce better results at competitive cost and time with the expanded technological resources now available to the recording and visual media. SMPTE may well be the key to such creative fusion. □□□

. . . the author in his ***SFX Studio*** *—*

My thanks to Clyde Spear of Vidtronics, Hollywood, for providing invaluable technical information during the preparation of this article.

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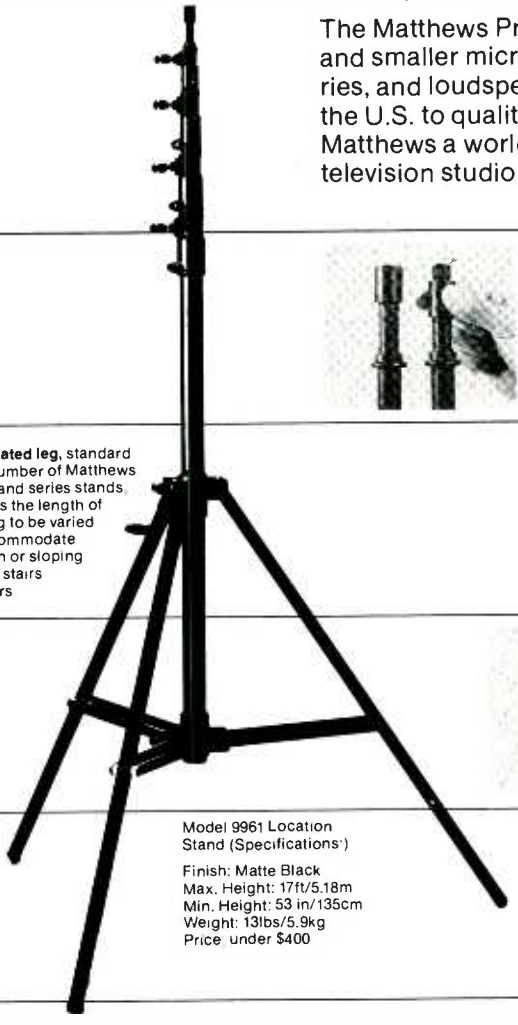

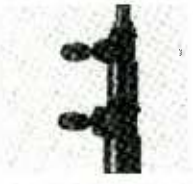

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Construction Project —

PEAK READING METERS

by
Ethan Winer

Peak reading meters, popular in Europe for years, are just now coming into greater favor in America, and for good reason. The main purpose for having a VU meter is obviously to monitor signal levels going to a tape recorder, reverb unit, or some other level-sensitive device, to help optimize the transfer of information. Too much level will produce distortion, and too little results in the inherent noise of the medium becoming a problem. Unfortunately, a conventional VU meter responds to the *average* level of the program material and not to the peaks; yet it is these momentary bursts of higher level that become distorted first.

Now I know that somebody out there would probably point out that VU stands for Volume Units, and that the real purpose of the meter is to indicate how loud something sounds. Without really wanting to dispute that issue, I'd just like to say that to really do the job correctly, we would first need to measure the true R.M.S. level of the program, and then follow that with an equalizer set to produce the Fletcher Munson auditory response curves. Now *that* would be a true volume indicator. (I wonder if it's too late to apply for a patent?) Actually, this is the basis for the "A"-weighting curve used to measure sound-pressure levels. R.M.S. and average levels are generally pretty similar — both employ an averaging process to arrive at the displayed level — but R.M.S. indication is the only way to determine the true "volume power", let us say, of an audio signal. This is the method of level detection that is used in products made by dbx, Incorporated, and is probably one of the reasons for their success.

But to get back to peak levels in music, we all know that when recording an electric bass with heavy limiting on it, there should be no problem if you regularly run levels into the red. The limiter will remove any brief transients that occur when the string is plucked, and the level will stay fairly constant. On the other hand, a snare drum, wood block or claves must always be recorded at what appear to be conservative levels, to allow for the VU meter's sluggish response. The pointer simply cannot move fast enough to keep up with the dynamics of the music; a rim shot can come and go before the poor meter has even made it halfway up the scale.

The main feature in a peak-reading meter circuit, therefore, is some type of memory that can remember how loud that rim shot really was, and hold the drive to the meter constant for the half second or so the meter requires to respond. Utilizing a circuit that can do this, and interfacing this circuit with the meters that you already have, is probably the most inexpensive route. However, if you are planning to go out and buy meters anyway, there is an even slicker alternative you can take.

One other important drawback to the common VU meter is the limited range that can be displayed on its scale. Standard markings go from -20 to +3, completely hiding low-level material and, at the other extreme, pinned solidly in the red before the tape is really saturated. Again, if I may complement dbx, Inc., meters in their limiters use a linear scale that can show a range of 60 dB in nice, even steps. Of course, when the range gets too large, it becomes difficult to discern changes as small as a decibel or so, but I do find great appeal in such an even scale marking.

The circuit required to perform this miracle is called a logarithmic converter. In the version presented here I have chosen to limit the converter's range to 50 dB, although this could easily be varied. Such a range was chosen not only to improve resolution and readability, but also because of the wide range of voltmeter types available with divisions already marked from zero to 10. You should be careful though, to select a meter that requires less than 10 mA of drive current. It is not difficult to remove the glass face and carefully white-out or paint over the exisiting numbers. Each remaining division mark will represent an increment of 5 dB, and new numbers can be applied with dry transfers indicating -40, +20, or whatever is wanted. Actually, -35 to +15 would seem to be optimum if your tape recorder operating level is 12 dB below 3% total harmonic distortion. (In other words, if +12 is clipping, +15 will still be on scale to show you that you blew it.)

One of the great things about building your own equipment is that you can incorporate any options you want, and skip what you don't. One possibility that immediately comes to mind is to place an equalizer in the path of the meter driver. This would be used to duplicate the response of a tape deck's built-in pre-emphasis curve. It's usually not a real problem unless you do a lot of recording at 7½ IPS, but at that speed you must have it if you want to see what's really going on to the tape.

Another possibility is an adjustable decay time, or even a peak-hold switch. In this mode, you could play a tape unattended, and when you return the meters would be sitting at the highest level that was reached. Otherwise, with the values shown, the attack and release times will conform to the standards established by the BBC.

Even if you don't want to build a peak-detector circuit, it is a good idea to put some active device between the output of your console or tape recorder and its meters. In the December 1980 isue of *R-e/p*, this point was well taken by Gordon Kapes, who observed the relatively high levels of distortion that a VU meter can add to the line across which it is connected.

Author's Note: ***Future Articles In The Series —***

When I first approached *R-e/p* about writing a series of construction articles, I had a clear idea of how I wanted to present the technical side of each project. No mathematics would ever be used to explain the operation of a circuit, and I would studiously avoid using any technical words that either had more than three syllables, or were derived from the name of some long dead physicist. It is my firm belief that nearly any electronic concept can be explained in practical, perhaps mechanical terms to those who may be technically uneducated, but who are, none the less, seriously interested. Resistors and capacitors can be fun, and it really isn't necessary to get bogged down with things like calculus or complex molecular theory.

The past few years have seen the development of some pretty exciting integrated circuits. While, on the surface, their behavior may seem complex, in reality the operation of these circuits can often be appreciated on a function-block basis. For example, it is not difficult to determine if an op-amp is functioning properly in a circuit, or if it is oscillating, even if you don't actually understand what's going on at the transistor and diode level. Many logic chips are easy too; provided you know what's going in, you can generally deduce what should be coming out. Anybody with a voltmeter and a little patience should be able to fix maybe 80% of the problems that typically occur in a recording studio. If you have a scope, even an inexpensive one, you could probably raise that to 90%. And if you don't even know which end of a diode is the cathode, hold on I'll be getting to that soon. In the meantime, keep your screwdriver away from the Harmonizer® or digital delay. You really do need to know what you're doing to fix one of those boxes.

Now, if you own a million-dollar studio with a full time technical crew, you probably don't care much about do-it-yourself projects or knowing how to fix things. When your master recorder develops a crackling noise on track 21, a spare machine can be rolled in and connected before the ailing deck is even half way to maintenance. Unfortunately, many of us do not have spare decks, console modules or maintenance departments for that matter, and repair bills can get to be expensive. Therefore, beginning with this issue, we will be going into more depth with circuit descriptions, and will be presenting in alternating issues a column on maintainance and troubleshooting techniques. Practical approaches to finding malfunctioning components will be offered, along with a balanced diet of basic electronic theory. Remember, the largest console is no more than a collection of single amplifier stages, and many problems can be traced to bad connectors, relays or switches if you know where to look.

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A totally different approach to metering would be the LED or bar segment meters found on many of the newer consoles. Also, there are systems for simultaneously displaying many channels on a TV monitor screen. Both of these methods are extremely convenient to use, when it is important to really see all of your channels at one time. National Semiconductor makes a pair of chips — LM3914 and LM3915 — which contain all of the circuitry necessary for a 10-segment display; these chips can also be cascaded to provide even more steps if desired. The 3914 is linear responding, and is intended for voltmeter applications. The 3915, however, is logarithmic and will provide increments of 3 dB which is much more useful for our application.

It would be pointless to go into detail here, when everything you could possibly need to know about the LM3915 is published in the National Semiconductor Linear Data Book. This book contains a wealth of information on not only National ICs, but all kinds of circuits and application tips. Even better than the Data Book, however, is the company's Linear Applications Handbook, in which great pains have been taken to provide clear and acccurate circuit descriptions. The tone is conversational; there is a minimum of math; and best of all the book is absolutely free! (That is if you can convince the local National rep that you are a potential user of their product, which shouldn't be too difficult.)

. . . continued overleaf —

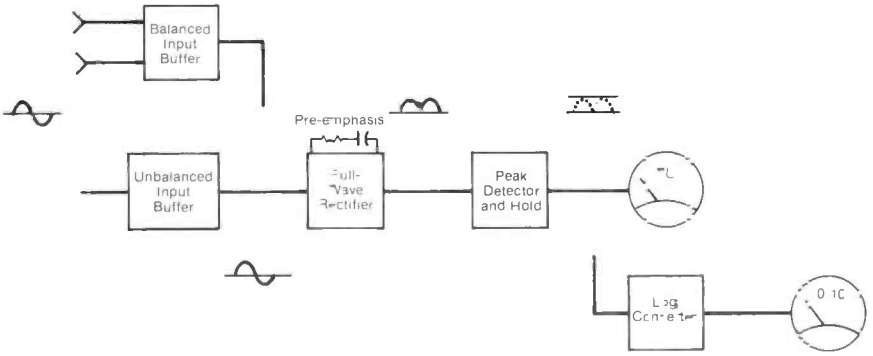

Figure 1: Block diagram of peak-reading meter, with choice of unbalanced or balanced inputs

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Another excellent and free book in the National Semiconductor library is the Audio/Radio Handbook. Dealing exclusively with audio components, many useful circuits are shown for phono pre-amps, FET switching cirduits, phase shifters, and the like. In fact, many of the circuits in this article were abstracted from the standard building blocks given in the Linear Applications Handbood. Also, it is important to mention my gratitude to Bill Eppler, the smartest person I know — and perhaps the best engineer in the world — for his kind and valuable guidance in the realization of these circuits.

But returning to the options, the "building block" approach is shown first in Figure 1. This illustrates how each stage in the chain comprised of only one or two op-amps, performs a separate and isolated function. You may choose between balanced and unbalanced inputs, EQ may be incorporated or omitted, and either log or linear response can be selected. Also, you can adjust the sensitivity of the circuits to accommodate the zero-VU point in you system. The log circuit is definitely trickier to implement but once you get it set up properly, it will be more accurate than the associated mechanical meter.

The Input Buffer

We'll begin our look at the circuits required by starting at the input to the chain. Pertinent waveforms are shown on the schematic to help visualize what's happening where, and the main signal flow is shown with heavy lines. Referring to Figure 2, IC amplifier A1 is used as a buffer to provide a low source impedance to the following stages. This will be particularly important if the pre-emphasis network (shown in outline) is utilized. If a balanced input is needed, the alternate circuit is suitable.

If the balanced input is fed from a single-ended source, ground the negative input and apply the signal to the positive input. You may reverse this for inverting operation, though in this case it makes no difference.

In order to obtain maximum common mode rejection, or freedom from outside interference, the 220 kohm resistors should be matched as closely as possible. Five percent resistors are sufficient only when there is no history of hum or RF problems. Otherwise, use either 1% tolerance or, if you have access to a good digital ohmeter, you can select matched pairs from your supply bin. As has been mentioned before, carbon-film resistors are more stable with temperature and over time than conventional carbon types, and they also have lower noise levels. The two resistors connected to the negative input should be matched as closely as possible; likewise, the two at the positive input. (It doesn't matter, however, if the two pairs are slightly different in value.)

The Peak Detector

Amplifiers A2 and A3 comprise a full-wave rectifier used to convert the negative portions of the waveform, as well as the positive, into positive-going only. This makes it possible to monitor the input voltage in both directions at the same time, greatly simplifying our task. Ignoring the pre-emphasis network for the moment, the signal appearing at the output of A1 is sent to two different routes. The signal sent to A2 is half-wave rectified by the action of diode D1, which allows through only one polarity of the signal. Since A2 is used in the inverting mode, the output goes negative for positive-going inputs, but that doesn't matter at this point. The negative half-cycles continue through the 10 kohm resistor to the inverting amplifier A3, where they will be combined with the non-inverting complete waveform from the input buffer. Notice that *this* signal is combined using a 20 kohm resistor, and it is here that an interesting thing happens. Any positive signal coming through the 20 kohm resistor is combined with a negative version of itself at twice the level — thereby not only cancelling it, but also over-riding the signal until the negative version dominates. For negative-going inputs A2 remains idle, allowing the signal through the 20 kohm resistor to reach A3 without interference, at which point all negative voltages are inverted again to positive.

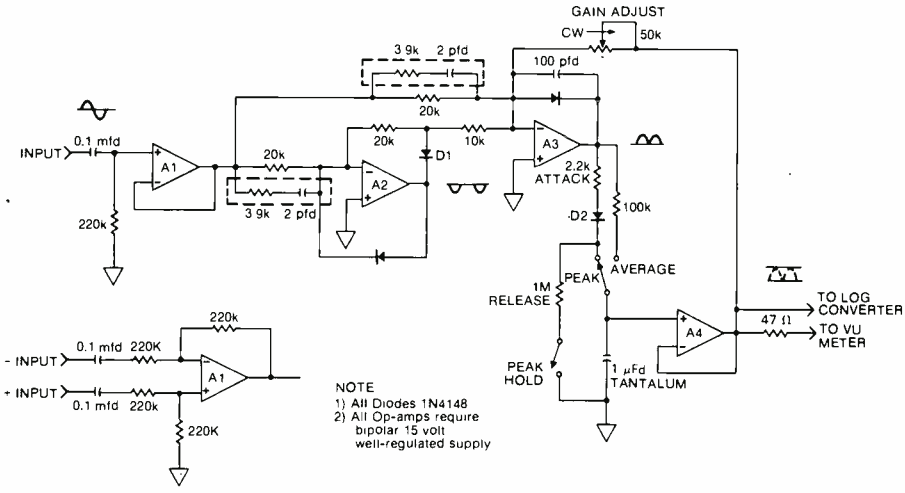

Figure 2: Input buffer and peak detector circuit.

Contrary to popular belief, inverting amplifiers were not invented by engineers who got bored with non-inverting amplifiers; each format has it's advantages. Non-inverting amplifiers have the highest impedance, while inverting amps make better mixers. The pre-emphasis networks go in parallel with the 20 kohm resistors, as shown in the schematic, and increase the gain at high frequencies. The values given in the diagram will yield a response similar to the NAB standard pre-emphasis used at 7½ IPS.

The signal at the output of A3 is now ready to be measured by the peak-detecting circuit. As the voltage rises, current flows through the 2.2 kohm attack resistor and diode D2, and places a charge on the 1 microfarad capacitor. As the waveform continues its cycle and starts to return to zero, the one-way action of the diode prevents the capacitor from being discharged, and the voltage is held for a time determined by the 1 megohm release resistor. An FET input op-amp is essential for A4, if the peak-hold option will be used, and the whole circuit could be nicely accommodated by a quad op-amp such as the TL074. Also, the microfarad capacitor should be Tantalum to ensure a long hold time.

I should mention that while I was testing the prototype, I observed the voltage fall to be about 1 dB per minute, when it should have been holding. It turned out that a leaky diode was causing minute currents to flow back out of the capacitor. This problem could also be caused by the FET at the op-amp's input, or by a defect in the capacitor itself. Once the diode was replaced, it was impossible to observe any drift, even after 5 minutes.

When average rather than peak response is desired, the diode and attack and release resistors are bypassed, and replaced with a single resistor. This can easily be accomplished with a switch, as shown in Figure 2. The final output that will drive the meter is taken from A4 through a 47 ohm resistor. This particular resistor is not needed here if the circuit will be used with the log converter shown in Figure 3, but it is always a good idea when connecting an op-amp to the outside world. The 50 kohm trimpot closes a feedback loop around the detector circuit, and is used to adjust the gain of the system.

The Logarithmic Converter

The log converter is definitely a different kind of beast. To help understand the concept, you could look at a piece of log graph paper, the kind used to display frequency response curves. The scale is continuously being compressed as you follow it from left to right, much like the scale on a slide rule. (Remember those?) So if, for example, the first 3-inches contain the range from 20 Hz to 200 Hz — or one decade — the next 3-inches will represent the decade from 200 Hz to 2 kHz. More total cycles are contained in the second group, but they are compressed to the same "value" as the first decade. The same principle is applicable to decibels and the way we hear. This is why on a normal VU meter, in order to read in dBs, the scale is compressed on the *left* to accommodate the linear response inherent in

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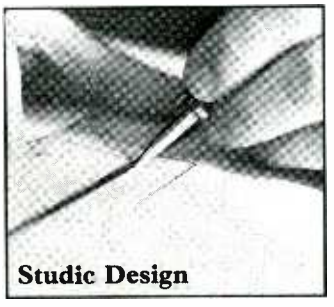

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this type of movement.

A circuit that will compress the output voltage of the peak detector is shown in Figure 3. This circuit takes advantage of a well-known property of the ordinary junction transistor: namely, that the voltage which appears between the base and the emitter is related logarithmically to the current flowing through the device's collector. Isn't that neat — logarithms in nature! By pumping a current through the transistor, and then measuring the resultant voltage across the base-emitter junction, we have accomplished our goal.

Referring to Figure 3, the voltage from the detector is applied to op-amp A5 through a 20 kohm input resistor. Since we are applying a positive voltage to the negative input, the output of A5 begins to go negative. This applies a voltage to the base of Q2 which, in turn, pulls down on the emitter of Q1. Q2 is required both to offset the initial 0.6 V base-emitter drop in Q1, and also to counteract any inaccuracies due to temperature. This is because the temperature of the logging transistor is also a factor in the operation of the circuit. By adding Q2 to the feedback loop, the other half of a matched pair, any changes in Q1 due to temperature will be exactly cancelled. (In fact, the change in a transistor's base-emitter voltage with temperature is also well known and constant over an extremely wide range. Many electronic thermometers are built using a transistor or diode as the sensing element, and can often cover a range of several hundred degrees.)

A reference current through Q2 is required to get things going, and is supplied from the 3.3 megohm resistor and the "full-scale adjust" trimmer. The offset-corrected voltage appears at the base of Q2, though its level is extremely low. A greatly amplified version of this same voltage is available at the output of A5, and it is here that we will connect the meter. Again, note the addition of the 47 ohm isolating resistor. The 1 picofarad capacitors are for high-frequency stability, since the addition of the transistors to the loop increases the apparent gain of the op-amps.

Because the circuit has the potential for dealing with extremely low-level inputs (log converters can be built with an input range of 100 dB or so), offsets and transistor matching become quite critical. In our version, -35 dB is as low as we go, but even at 20 or 30 mV, an offset adjustment is required. In order to ensure a high degree of transistor matching, a dual transistor is the obvious choice. The National books suggest the 2N2920, or their own LM394, but RCA and National also make the 3086 transistor array, which costs much less. There are many other suitable NPN arrays, although high Beta (forward gain) is an important requirement.

These dual transistors or arrays are like simple integrated circuits, except that only two or, in the case of the 3086, five transistors are made at one time. The advantage in doing this is that both transistors are guaranteed to be not only from the same original silicon wafer, but also will be next door neighbors, so to speak. If you do use the 3086, it is important to connect pin 13 — the substrate — to the negative power supply. Also, two of the transistors already have their emitters connected together, and these are the two you should use.

It is important to note that the output voltage to the meter is of a negative polarity, which will necessitate reversal of the meter wires. This is so easy to do that there is really no point in adding another op-amp inverter stage just to make the output go positive.

Adjusting The Log Converter

After you are sure that there are no mistakes in the wiring, apply power to the circuit, and adjust the offset trimmer to be at the middle of its travel. You can do this by placing a voltmeter between ground and the wiper, and adjusting for zero volts. After doing this mechanically place the other two trimmers in their center positions. Apply a 1 kHz signal at a level that you want to be full scale or, in our case, +15 dB, and adjust the full-scale trimmer for an output of -10. Reduce the input voltage in 10 dB steps — easy with most signal generators — and observe that the output falls by approximately 2 V each time. Adjust the "dB/Volt" trimmer to make the steps exactly 2 volts, though you will probably have to go back and re-set the full-scale trimmer once or twice. When the steps are accurate and the full scale is correct, apply an input at -35 dB and adjust the offset trimmer to give exactly zerovolt output. Again, you may have to go around a few times with the trimmers, but it really shouldn't be too difficult to get it set up properly.

since we are not encompassing a 100 dB range, the adjustments should not be too sensitive to changes in temperature, but if you do observe any warm up drift, it is advisable to use a thermistor in place of the 1 kohm resistor. the correct one to use here is manufactured by TelLabs, Manchester, NH, and is their type Q81. It is in all basic respects a resistor, except that its resistance changes with temperature in a controlled and useful manner. In this case, it is used to compensate for the way temperature affects the logging transistors.

Using peak meters will undoubtedly seem strange at first but, once you know what you are looking at, there should never be guesswork involved when setting levels. If you are using a normal VU meter with the peak-detecting circuit, you will probably want to adjust the gain trimmer so that zero is at a slightly elevated level on the tape — say 3 dB — below clipping. This will be desirable since you now have the capability to monitor the peaks as they approach saturation.

The British Broadcasting Company's format for peak-program meter scales, shown in Figure 4, offers a display range of slightly more than 24 dB on a logarithmic scale. If you prefer to utilize this design of scale, simply substitute a 0-5 voltmeter for the 10-volt type, and reduce the value of the gain trimmer to 10 kohm. The rest will be taken care of during calibration, although you will need to be more creative when re-numbering the scale. Each step, by the way, corresponds to 4 dB. □□□

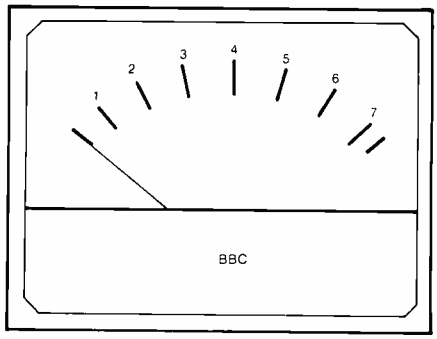
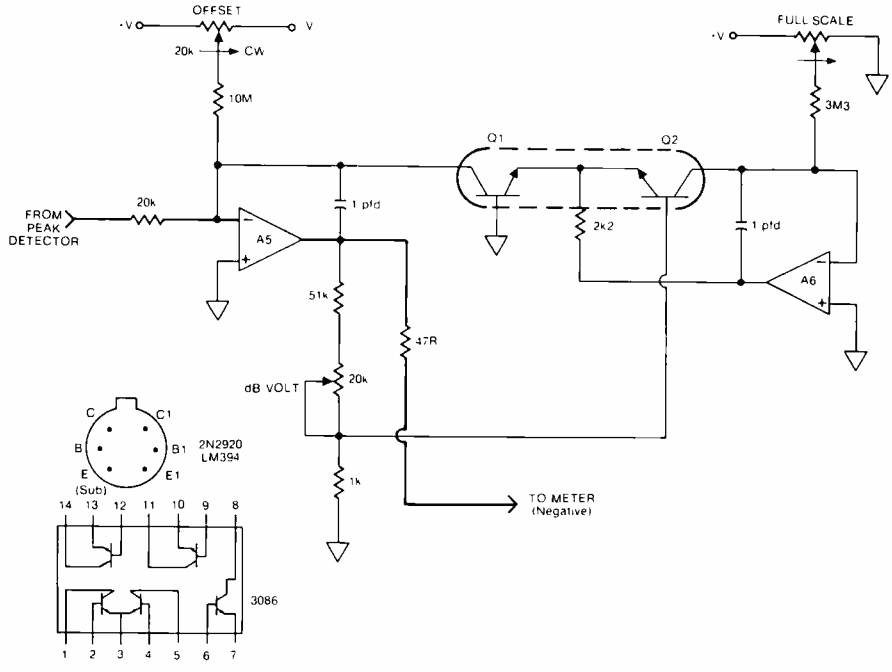


Figure 4: Front panel layout of BBC-style peak-program meter.

Figure 3: Log converter and meter output circuit.



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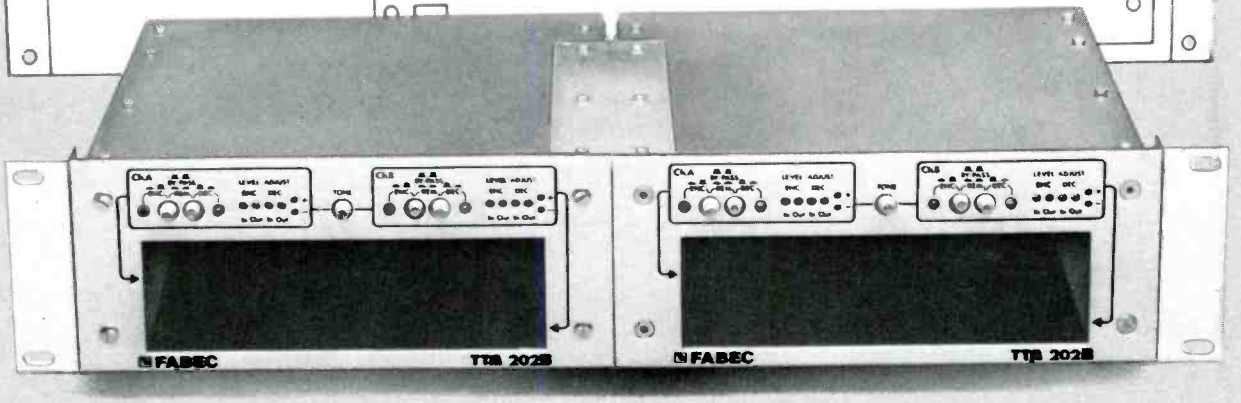

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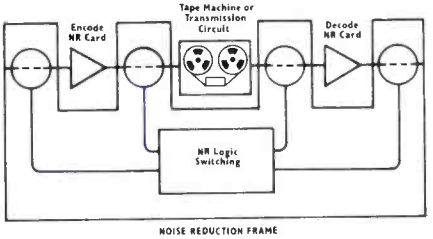

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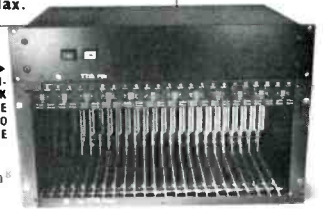
*You can, of course, buy Dolby® or telcom® cards, alone, without their frames.



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. . . Sound 80 chief engineer Scott Rivard with the 3M system

. . . the author with his Sony system

-DIGITAL RECORDING-

— hands-on experience with the: 3M Stationary Head System at SOUND 80 STUDIOS

by
Susan Donato
3M Company

History was made in late February when Minneapolis-based Sound 80 Studios produced what is believed to be the first network television commercial involving the merger of digital audio and video tape recording techniques. The finished product—aired for the first time on NBC's *Meet the Press* in March of this year — was a 90-second spot for Archer Daniels Midland (ADM), entitled *Pioneering*. The commercial presented an historical review of food processing technology during the past 60 years, emphasizing ADM's role in providing agri-business products that improve the quality and quantity of food grown and processed to meet the needs of a growing population.

Sound 80 is a relative pioneer in digital recording technology. As early as 1978, its studio used the prototype of 3M's Digital Mastering System to produce a widely-acclaimed recording of Copland's *Appalachian Spring* by the Saint Paul Chamber Orchestra. (*Appalachian Spring* was nominated for three Grammy Awards, and won recognition as the Best Chamber Music Performance.)

Since that time, Sound 80 has been involved in a number of digital recordings. It recently released a unique album, *Spaces*, composed and produced by the studio's president and creative director, Herb Pilhofer. *Spaces* was the first album created specifically to explore the possibilities inherent in digital audio recording technology.

Sound 80 is a sound studio rapidly expanding into video. Herb Pilhofer linked their digital mastering expertise with 1-inch video tape technology in recording the audio for the ADM commercial.

The Basic Steps

Pilhofer's original score begins with jazz music of the 1930s, heavy in percussion and brass, and follows the theme of the commercial into an orchestral arrangement with overdubs of piano, strings and harp. He directed 24 Twin Cities musicians, keeping one eye glued on a video tape of the commercial — produced prior to the recording session — on a nearby monitor. Sound 80 chief engineer, Scott Rivard, was also able to view the taped commercial via a monitor in the control room.

— *continued overleaf . . .*

— hands-on experience with the: SONY Rotary Head System at SPECTRUM STUDIOS

by
Arne Frager
Spectrum Studios

At the Los Angeles AES Convention in May 1979 I had my first look and listen to the Sony PCM digital recording system. Although impressed, I have long felt no intelligent listening or comparison can be made amidst the sales patter, tromping footsteps and rustling of manufacturers' specifications that dominates AES Shows. I asked Roger Pryor, Sony Digital Division Manager, for a demo of the system at my facility, so we could properly evaluate its performance. I had no idea then, this would prove to be the beginning of two of the most rewarding and exciting, not to mention busy, years of my life. With the 1981 Los Angeles Convention this month, it seems appropriate to pause and reflect on the more than 30 LPs and hundreds of hours of recording, editing, and mastering that Spectrum Studios has performed with the Sony PCM-1600 System.

Although we originally purchased the system to provide superior quality recording for our clients, Spectrum Studios has been requested by several clients to go on location and record or master their albums. We have performed live stereo mix records for many jazz artists, some rock bands, and a couple of R&B acts. Also, several LPs are hybrids: they were recorded on a 24-track analog recorder, and then mixed down to Sony PCM-1600 two-track digital. Several projects were recorded overseas and brought to us for sweetening, editing, assembly and disk mastering. We have even designed live multi-media industry shows with digital sound. The overall reaction to the Sony system by our engineers, producers, artists and myself is excitement and enthusiasm. And my reaction to its manufacturer: bring on the multi-track!

As I gaze around my control room with a fond farewell look of appreciation to my trusty 24- and 2-track analog recorders — and with visions of bankers and leasing companies with glints in their eyes as we prepare for the rest of the digital recording system — I keep thinking: "Is it really worth it?" The answer comes back during replay: no noise; dynamic range close to real life; flawless electronic editing; master copies identical to the original recordings; truth and clarity never heard before; and soon the digital disk so that consumers can hear at home exactly the same as I'm hearing in the

. . . *continued on page 124* —

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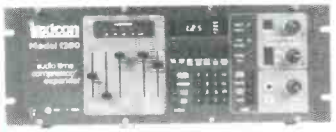
THERE'S A NEW PRODUCTION TOOL IN TOWN



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(continued from preceding page)

The 3M System —— *Susan Donato*

Figure 1 shows the layout of the studio, control room and equipment. Musicians, microphones, hard and soft baffles were positioned around Pilhofer, ARP piano and video monitor. In addition to the Trident TSM 40-in/32-out mixing console and another video monitor, the audio control room contained a BTX Systems SMPTE controller, 32-track/30-channel pre-mix digital audio recorder, and a VCO interface box designed by 3M. The only other piece of equipment needed for the production was a 3M Model TT-7000 1-inch, C-format video tape recorder.

Twenty-seven digital audio tracks were utilized during the recording: 22 music, one SMPTE time code, one click track, one for voice-over, and two for mix-down. The video-taped commercial had been previously combined with the SMPTE time code from a film original, the time code being recorded at the same time as the image, to ensure synchronization when the final mix was locked-up with the video.

When recording began, one channel of the digital multi-track recorder carried the video tape time code, while another was used to play a previously recorded 12-frame-per-click click track. The tempo could then be monitored two ways: by watching the video tape, or by checking the click track.

The purpose of the synchronizer was to compare the master time code with the digital audio time code, and so achieve a lock-up between the audio and the video. The SMPTE controller receives a time code from both the digital recorder and the VTR, and generates the control signals sent to both units.

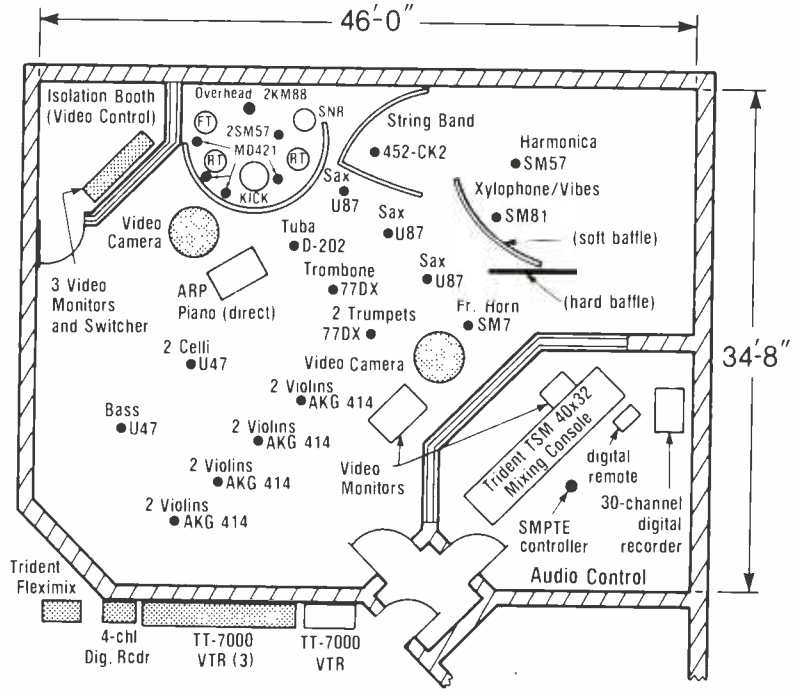

Figure 1. Studio 1 Layout for Musician's Session. Shaded Areas show Equipment used for the Documentary.

A New Era

The synchronization of digital audio recording with video heralds a new era for recording-studio technology. There are numerous advantages, both technical and creative. On the technical side, according to Pilhofer, "The quality of digitally-recorded audio is unquestionably superior to recordings made using analog techniques. The sound is as 'transparent' or as full as the source, with better clarity and more brilliance over a substantially greater dynamic range." The difference in signal-to-noise ratio between analog and digital is over 20 dB; approximately 94 dB.

Resolution of sound is also identical to the original, because no noise or distortion is generated when tapes are duplicated. Wow and flutter are not measurable, intermodulation (IM) and harmonic distortion being less than 0.03%. No matter how many generations of tape are required in the processing of a commercial (typically six and sometimes as many as 10), the quality of the audio signal, as has been stressed many times before, does not degrade so long as the signal remains in the digital mode.

One big advantage for the recording studio engineer, when synchronizing digital audio with video, is the 30-channel capability of the 3M digital recorder. This provides up to six additional channels (compared to typical

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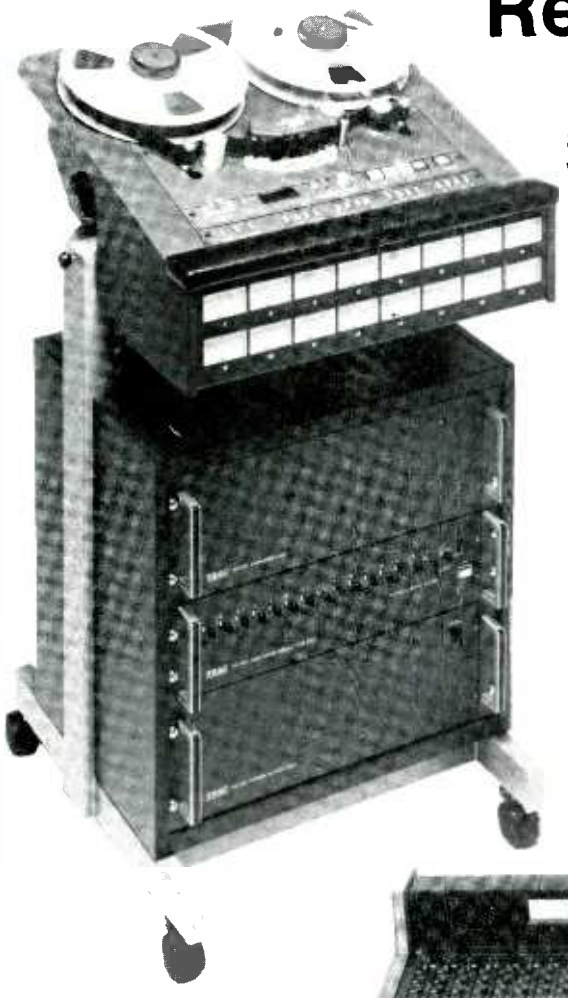

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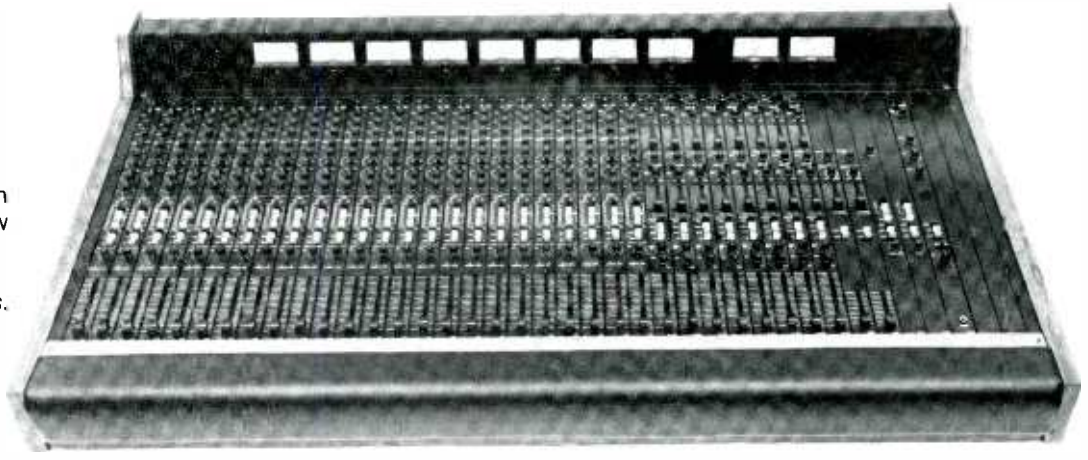

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The 3M System —— *Susan Donato*

analog systems) for increased flexibility. According to chief engineer Scott Rivard, "The additional channels were good to have for the ADM commercial, especially when it came down to mixing. We mixed within the 30-channel recorder, storing the data and time codes on the same piece of tape that the music components were on. This speeds things up if you have to do anything over, because you can just punch in on the various channels." Another plus cited by Rivard is the absence of crosstalk, which allows one to record alternate versions on adjacent channels without interference.

On the creative side, Pilhofer sees digital commercial recordings as "bringing more spontaniety and immediacy to the entire process. Musicians can now react directly to a video-taped statement on a real-time basis, and this definitely enhances the musical communication."

Merging Technologies

All indications point to increasing use of synchronized digital audio/video productions for television commercials and programming at the outset. The video industry, for example, is becoming increasingly interested in the quality of sound for its productions. In time, television receivers will have high-quality audio systems capable of obtaining maximum results from digitally-recorded sound. □□□

(continued from page 120)

The SONY System — *Arne Frager*

control room. Of course, the answer is a resounding: Yes! Digital is the future, and the future is here at last.

Recording Sessions

I have recorded everything from a solo pianist to a 40-piece jazz band with two vocalists in live recording sessions. My favorite recording style is the live stereo mix date. Everyone on such a session is attuned to a performance attitude where you don't get a second chance. In fact, if it's a studio session you actually do get a second or third chance because, unlike a direct-to-disk session, digital recordings can be edited with even greater accuracy and flexibility than the conventional razor blade and tape allows.

The PCM-1600 records its data on a Sony ¾-inch video cassette recorder; usually the BVU-200. Early in our experience we adopted a better-be-safe-than-sorry attitude by running two BVU U-Matic recorders in parallel. The chances of encountering a bad section of video tape on both machines is very low. Since video cassettes are relatively inexpensive, it's worth the additional cost to always have the security of a back-up master, just in case something happens to the original.

Even in the studio environment, the jazz LP or live rock band lends itself to the live stereo mix approach very nicely, since the knowledge that a live mix is in process puts musicians, engineer, and producer on notice that it can't be "fixed in the mix," — it's now or never. At Spectrum Studios we have recorded composer/arranger Russ Garcia with a suite for string quartet and jazz trio; Shelly Mann Quartet; Milt Jackson; Joe Pass; Clark Terry; S.O.S. Band; Lee Michaels; and Stalworth Band using this technique. Our console is a Harrison 28/24, and all mikes are sent directly to the stereo remix bus.

Overdubbing Techniques

Many groups in these categories do not need multi-track recording techniques for extensive overdubbing, but would love to add just one or two overdubs to complete their record (such as that one important guitar solo, etc.). Much to our surprise we found that it is possible and practical to perform stereo overdubs on the Sony system. The original recording is played back on one BVU-200 machine, through the output section of the PCM-1600, and brought back through the console. The overdub is setup in the studio, mixed through the console, and recorded on the other BVU-200 via the PCM-1600's input section. This is possible since the input (encode) and output (decode) sections of the PCM-1600 are capable of independent and simultaneous operation. An identical technique is useful for sweetening, equalizing or rebalancing an existing digital recording, and is particularly useful for creating an equalized lathe master during the disk-cutting process.

On the larger session scale we recorded the Count Basie Big Band with Big Joe Turner and Cleanhead Vinson (the album was titled *Kansas City Shout)* at Group IV Recording in Hollywood, California. This date was a collaborative effort with Dennis Sands of Group IV. We decided to put the Sony system through its acid test, since we were dealing with real dynamic music that has lots of peaks, high-power transients, and so on. The session was recorded without limiters or compressors, and pushed the Trident A-Range console to its maximum. We recorded levels and peaks that consistently stayed at the top of the Sony PCM-1600's meters — and they have a measurement range some 40 dB greater than the usual VU range to begin with.

I was more than grateful to Sony when we listened back . . . I was relieved! Crisp, punchy recordings with no tape saturation; reproduction of peaks on vocals and horns that are scary. Getting this master on to a conventional disk was a good trick that will be discussed later in this article. I think this is one of the most exciting big band jazz records that I have ever heard. I extend my gratitude to Dennis Sands and Angel Balestier of Group IV Recording for their efforts; also to Norman Granz, the producer who gave us this opportunity to try something new with such a fine band as the Count Basie Orchestra.

— *continued overleaf . . .*

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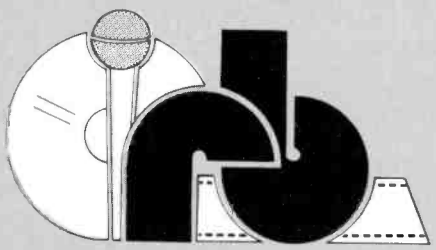

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Post-Production Sessions

During our first few weeks of evaluating the Sony system in 1979, we were already in the process of mixing down an album from 24-track. The group was a rock band named The Cryers, with engineer Eric Prestidge, and producer Jim Mason. We made several comparison mixes to analog and digital, and the results were surprising to us all: the PCM master was very noticeably better. Eric Prestidge decided to mix the entire album on the PCM-1600, and thus our first digital LP was mastered before we took delivery of our own unit; the client demanded it and, of course, we try to please our clients.

The Bob Florence Big Band album was recorded *Live At Concerts By The Sea* on the early PCM-1 system. We were asked to rebalance, remix, and sweeten the PCM-1 digital recording and transfer on to the PCM-1600. With the aid of parametric equalizers and our EMT 250 digital reverb unit we remixed the LP; it has been nominated for a Grammy Award in the Big Band Jazz category. Thank you Bob Florence and Albert Marx, producer.

A number of LPs that we've worked on at Spectrum Studios were recorded in Europe, and for which we completed the project with editing, master assembly, preparation of the lathe master, and disk mastering. These albums include the Count Basie/Ella Fitzgerald LP, *A Perfect Match* (a recent Grammy Award winner, in the jazz vocal category), *North By Northwest* filmscore (a digital release on Varese-Sarabande), and LPs for Doc Severinson and Dizzy Gillespie.

In the process of working on these projects we have experienced hundreds of hours of digital editing with the early BVE-500 unit, the prototype DEC-1000 editor, and the new DAE-1100. The evolution and revolution in editing introduced by Sony is very impressive. The BVE-500 is a brute force editor/controller: it uses the audio tracks on the VCR to edit, and is accurate to one frame, or 1/30th of a second. The BVE-500 editor cannot usefully preview the edit points, and has no way of effecting cross-fades between cuts. If the recording engineer forgot to fade on the original master recordings, we often used the Sony PCM-1600 in the previously-described "Overdub Mode" to bring the program through the console, and remix the fades as we edit and assemble.

The new SMPTE-controlled editors have changed all that. The Canadian Broadcasting Corporation edited two LPs, Stravinsky's *Firebird Suite* and Beethoven's *Eroica (3rd) Symphony* using the DEC-1000 editor, and their music editors were amazed at the system's speed and accuracy. An editing accuracy of 90 microsec.; the ability to preview and review edits at any time before committing them to tape; and the ability to alter the "angle of the razor blade cut," gives the editor new possibilities never before available with analog tape.

We are now awaiting delivery of our Sony DAE-1100 unit, which is the final version of this editor. The primary difference between the two is the packaging, but this newer machine has one additional feature that is particularly useful: the ability to perform pure digital crossfades or matching of levels on either side of the edit point. As a result, editing a digital LP will now be a speedy and enjoyable process. When we began our digital sessions, it was a slower, somewhat tedious process, and I missed my razor blade. With the new innovations offered by the DAE-1100 editor, the blade seems old fashioned, and very slow.

The usefulness of editing digital recordings was one of the criteria in selecting the Sony system. The only other comprehensive editing system that compares to the precision and flexibility of the DAE-1100 is not available for purchase from its manufacturer, and you must fly to the company's editing facility to do your post-production work. This may be fine for the occasional LP, but if you own a recording studio your clients would like to complete the product there at their convenience.

Any new digital multi-track must also edit easily and swiftly, to be truly effective and competitive with today's analog multi-track machines. The usual reason for editing a multi-track master is to use a portion of Take 1 basic tracks with a portion of Take 2 or 3 basics, and hence put together a master take that will be used for overdubs and the final mixdown. To offer the same flexibility as an analog multi-track, it is essential that such editing be performed on one, rather than two digital multi-tracks. Either the conventional razor blade or the electronic DAE-1100 type editor will make such a multi-channel system as useful as the PCM-1600 is today.

Disk Mastering

We have participated in the mastering of over 40 albums at several disk-mastering rooms located in the Los Angeles area. My thanks for all the technical assistance goes to Bernie Grundman of A&M, Greg Fulginiti of Artisan, Bruce Leek of IAM, Dave Ellsworth at KM Records, and Arnie Acosta at Precision Lacquer.

The disk-mastering process is perhaps the most challenging part of the digital recording process, because it involves program material with extended dynamic range, accurate and sometimes too faithful low-end production, and no noise. And then trying to coax them on to a conventional disk that suffers from surface noise, wow and flutter, etc. Just some of the problems we've encountered include:

1. Oops: We recorded those peaks too well; the Sony digital system can take them but the disk cutter can't! Solution: Record with the disk mastering process uppermost in mind, or you may have to limit the program on to the disk.

2. Resistance to change: On one date we walked in to cut a digital tape, and the cutting engineer was proceeding without us. The equipment had arrived early and he was able to operate it well enough to make a two-track, 15 inches-per-second Dolby copy, from which he was disk mastering (much to our dismay)! Once we showed him the proper preview signal his attitude changed, and we cut the disk from the digital master.

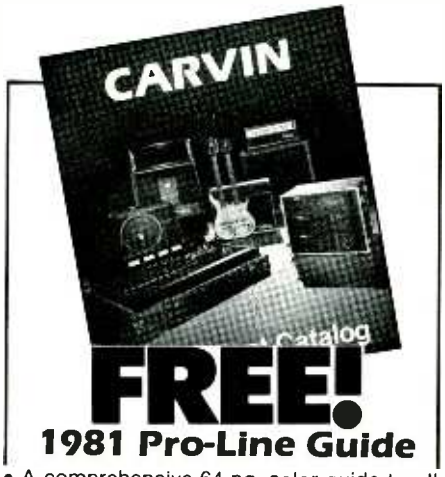
3. Oops: The sides are too long; for a digital disk mastering session the shorter the sides the better. Since dynamic range is so much greater than on an analog recording, it is a more critical parameter. I shoot for 18- to 20-minute sides wherever possible, especially if the music is loud, or if there are significant peaks (as in rock, jazz, R&B, and classical music).

4. A digital recording of a solo piano has *no* wow and flutter, and sounds amazing. If your reference lacquer has wow and flutter, it has been introduced by the lathe — the digital exposes such problems.

5. The lack of noise on a digital recording exposes the worst about record surface noise in lacquers during the mastering process, and in the vinyl during the pressing process. On the *Kansas City Shout* album there was a cut where the band laid out, followed by a large vocal peak or "shout." In the process of pressing the disk a slightly incorrect heat cycle caused severe pre-echo, similar to tape print-through. While cutting the same LP we encountered problems at the inner diameter, where piano peaks simply didn't want to get in the inner grooves.

Fortunately, we have been able to try different mastering tricks and work around these problems. The easiest solution is the old tried and true one, which is to record with these disk limitations in mind — until, that is, the day arrives when the consumer can buy a laser digital disk. Hopefully that day is not too far off.

In addition to the video track, BVU-200 U-



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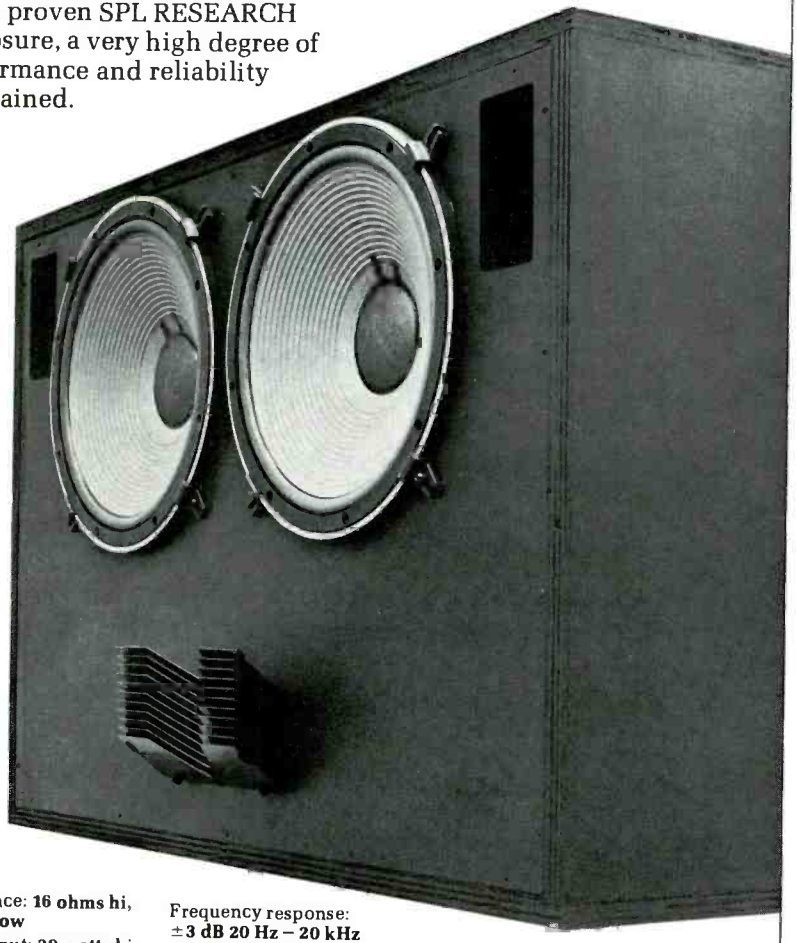

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Sony PCM-1600 digital processor and BVE -500 U-matic editing console.

Matic video recorders have two audio tracks that are used to record the program material side by side with the digital data. These tracks enable cueing (and, in the early editor, provide editing information) and also supply the preview signal necessary for a cutting lathe to compute the variable groove spacing. The last step in the edit/assemble process is the preparation of an appropriate preview signal on these two analog tracks. Frequency response of the analog signal is 50 Hz to 15 kHz, ±2 dB, which is more than adequate for the cutting lathe. Most disk-mastering systems are concerned with the low-frequency response of the preview signal — say below 5 kHz.

This final lathe master is created by copying the digital master on to a second machine, using the editor to back up the first VCR by the exact amount of desired preview signal (for example, 1.1 seconds in the case of most Neumann systems, and only 0.166 seconds for the Cybersonics system). The analog tracks are then inserted by transferring the PCM-1600 playback from the first VCR, which contains the final master. The resultant lathe master now has all the information to cut the lacquer acetate master.

While the process of using audio tracks on the BVU-200 VCR to derive a preview signal is adequate, a significant improvement is imminent from Sony. A 16-bit digital delay for "dialing-in" different preview signals, depending on which lathe you plan to use for mastering, will be a useful addition to the Sony PCM product line.

Reliability, Maintainability and Company Support

Anyone who is using a digital recorder for live sessions is in a production environment, and must have reliability and maintainability. The Sony PCM-1600 has been in use at Spectrum Studios since July 1979, and our experience has been very good. We have never lost a session due to downtime, and the equipment has performed beautifully on every session. The product performs as advertised, and no company field testing has transpired . . . it is a *product*. Although the documentation and operator's manuals possibly leave something to be desired, they are improving as times goes on.

There were instances of digital dropout that worried us when we first obtained the system. However, by using an improved video-cassette tape, conscienciously cleaning the videoheads, and learning a better machine operating procedure, we have virtually eliminated this problem.

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Pair of Sony BVU-200 recorders at Spectrum Studios

Video cassettes sent to us from all over the world with sessions recorded on other machines have *always* played on our machines; there has been no compatibility problems whatsoever. In addition to the Sony system being very reliable, we have hauled it all over the city for recording and mastering sessions, and it travels very well.

Sony has been very supportive of its system and our efforts: improvements and modifications have been made at no charge; cables or a spare board have been loaned for a location date; we've borrowed new editors; even taken part in a trade-in program to upgrade the PCM-1600 to the newer PCM-1610 system.

In addition to a significant price reduction of $15,000 in the new PCM-1610, Sony has incorporated several modifications and improvements, some designed by its engineers, and some suggested and implemented by those of us in the field with PCM-1600s. The improvements include:

1. A SMPTE time-code generator has been built into the PCM-1610 for "striping" the original digital tapes as they are being recorded. Since the DAE-1100 editor uses SMPTE code, recordings are "edit-ready" as they are made.
2. A front-panel switch allows the user to select transformer-coupling of inputs and outputs, or capacitance-coupling for people who prefer a transformerless recording system.
3. Also, the transformers and op amps are now Deane Jensen models and, as a result, audio performance is much improved.
4. A front-panel switch allows the user to select the width of window for the automatic mute process that PCM-1610 muting performs, in the event of an error during playback or tape dropout. This allows you to manually override the muting circuit if necessary, and is often useful in extracting problem tapes at disk-mastering sessions.
5. Better documentation and operator's manuals are now available.

We have only two requests to make of Sony: where's our multi-track recorder?, and please lower the prices!

Some Concluding Thoughts

Only two years ago many self-proclaimed captains of our industry were heard to declare that digital recording was five (some said 10) years off, and certain direct-to-disk *afficionados* flatly derided the digital sound as unnatural, and that the "high-end" was all wrong. Though there are still a few naysayers left, their numbers seem to be rapidly diminishing as fast as the major artists and record labels race to join the digital revolution. Recently I counted five out of the top 10 *Billboard* LPs that were recorded with Sony digital equipment. Most new classical recordings in the United States are also digital.

I recently read an article by a well-respected studio designer who two years ago said that digital recording was five or more years away. This year he starts his studio design article by mentioning that in the 1980s and '90s we have the digital revolution, which means new triple ceilings and isolation techniques had to be incorporated into his latest large studio project. Voices of certain direct-to-disk advocates, who state that digital doesn't sound good, are being drowned by a chorus of those who pronounce it as a vastly superior medium.

I won't attempt a list of artists, record labels or equipment manufacturers who are already totally committed to digital; it's too long and growing too fast. I predict that as more multi-track recorders become available, and as prices come down — as they inevitably must — you will see more used analog recorders and more professional recording studios lining up for their new deliveries.

The big explosion will take place during the next five years as the consumer becomes the final link in the chain to have digital sound. We look forward to more digital recordings, and to the day when the consumer can buy a record that sounds as good as the ones we can now make in the studio. □□□

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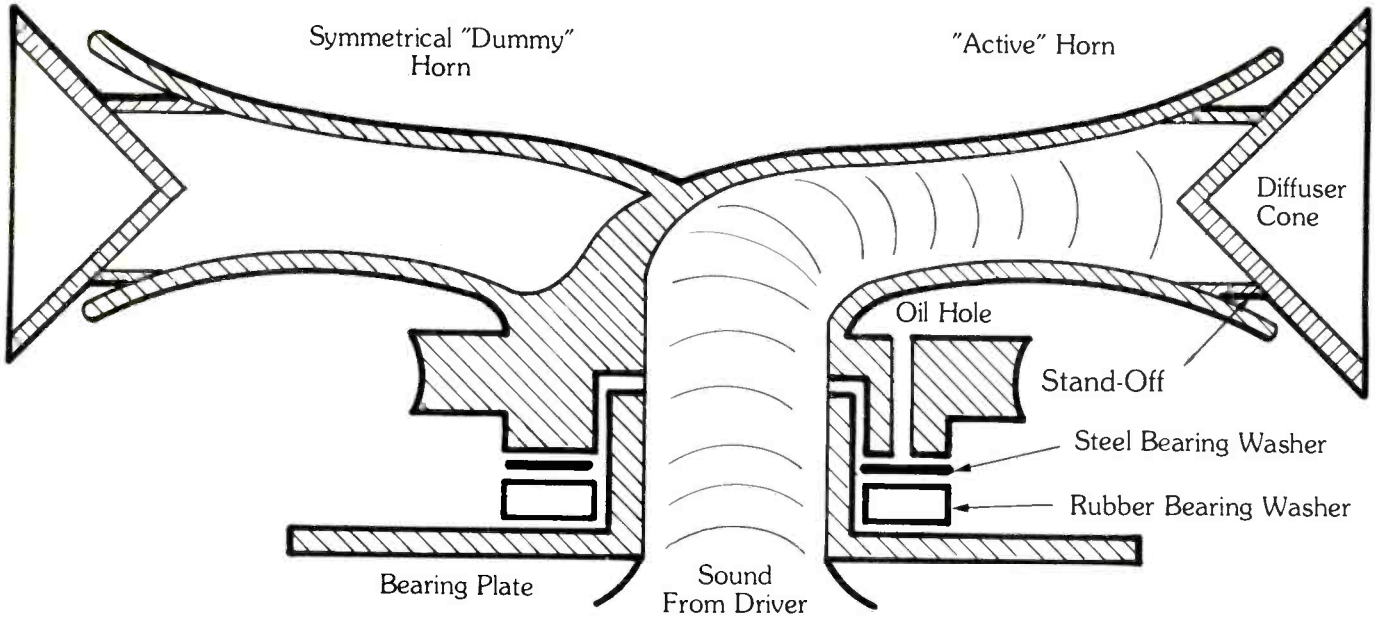

Figure 1: Plan-view of the Leslie Treble Rotor

UNEARTHING THE MYSTERIES OF THE LESLIE CABINET

by Clifford A. Henricksen
Community Light & Sound, Inc.

The Leslie Rotating Tremolo Speaker System has produced the same unmistakable sound for so many musicians that it has become an international institution for the recording and performing musical arts. Everything from the venerable Hammond B-3 organ, to human voices and electric guitars, have been processed by the Leslie Sound, and have ended up on countless hit records. This article is an attempt to unearth the mysteries of its operating principles, and includes a discussion of the Leslie Cabinet's practical use in both stage and studio situations.

My love-hate relationship with Leslie Speakers began with the purchase of a Hammond organ during the mid-Sixties. The salesman told me I would probably end up buying a Leslie for it, a statement that I dismissed as the usual sales banter. Besides, at the time I had no idea what a Leslie was anyway. The Hammond was purchased because that's what the Animals' organist, Alan Price, used on all the group's early hits, especially "The House of the Rising Sun." I saw the band live in Schenectady, New York, where they put a Hammond M-102 direct into a Fender Bandmaster Amp, and I *had* to have this sound. I soon discovered, however, that my new musical heroes had a *better* sound. It wasn't long before I knew that Booker T. Jones, Felix Cavaliere, Gary Brooker and Billy Preston (and many others) were *all* using Leslies. *This* was The Sound!

My first Leslie, a single-speed Model 45 with a 40-watt tube amplifier sounded great, but it literally got lost in the roar of the Boston-based rock and roll band in which I was then playing. Two big Leslie Speakers were cumbersome to move; they weren't a big improvement in level (plus 3 dB); *and* the high-frequency drivers broke. From then on, it was guerilla speed shop tactics (mill the heads, oversized pistons, etc.), to the point where I could finally be heard over *any* guitar player. As a result, I became an expert at Leslie repair, modification and special use, occasionally even letting a few guitar notes into my beloved machines. I've spent the past 15 years in and out of the Music Business, both in studios and on stage. The significant part of this time was spent in some way dealing with Leslie Speaker Systems. As you might guess, this is a rock and roll story; I might as well show my bias here and now. With this in mind, here's what I have learned over the years.

PRINCIPLES OF OPERATION

First and foremost, the Leslie Rotating Speaker is designed as *a sound modification device*. It is not a "Hi-fi" speaker, but rather a part of a musical instrument. You buy a Leslie to *change* the sound of an instrument, not to reproduce it.

The Leslie Speaker System, thoughtfully named after its inventor, Don Leslie, operates on a simple principle: a directional sound source is rotated at constant (or variable) speed around a fixed pivot point. At a listening point some distance from this whirling affair, three things happen. First, because the source is directional, the *intensity* of the sound will be at a maximum when it points at the listener (or microphone). The sound intensity will increase as the rotating source approaches dead center, and decrease as it rotates past this point. The resultant effect is called amplitude modulation (A.M.), which is no big thing, and is a feature on any guitar amp with a "vibrato" or "tremolo" feature. By moving closer to the rotating speaker, the inverse square law will increase the modulation effect.

However, the *big deal* is the Leslie's ability to create frequency modulation (F.M.). As the source rotates toward the listener, its relative velocity will increase the pitch of any tone it produces; as it rotates away, the pitch will be lowered. This is exactly the same Doppler effect that causes a train whistle (or any other sound on the train, such as grunting pigs, or shrieking passengers), to rise and then fall in pitch as the train approaches and then passes.

Lastly, if you are listening in a room with any significant reverberation, a complete spatial modulation of the sound will happen, as sound is "shot" all around and goes through multiple reflections.

If you want a real treat of all kinds of bizarre whirling horns and things, order copies of Don Leslie's original U.S. Patents: RE#23,323 and 2,622,693, available from The United States Patent Office, Washington, D.C. 20231, for a fee of 50¢ per copy. These patent specifications are incredibly entertaining documents, and a must for any Leslie fan.

The Real-Life Leslie

A practical and commercial manifestation of the Leslie principle may take on many forms. Indeed, the manufacturer of Leslie Speakers, Electro Music, Inc. (now a division of Hammond Organ), produces a wide variety. These include models with reverberation, triple channels, and rotating-cone speakers. However, any Leslie afficionado will tell you that the Leslie Models 145, 147, and 122 are the ones with "The Sound." All three Models share the same basic innards: a 40-watt monophonic tube amplifier; an 800 Hz 16-ohm passive crossover; a rotating treble horn and a rotating bass speaker. Both rotating speakers are available with slow and fast A.C. induction motors. (Older Models 45, 47, and 22 are *identical*, except for having single-speed rotors.)

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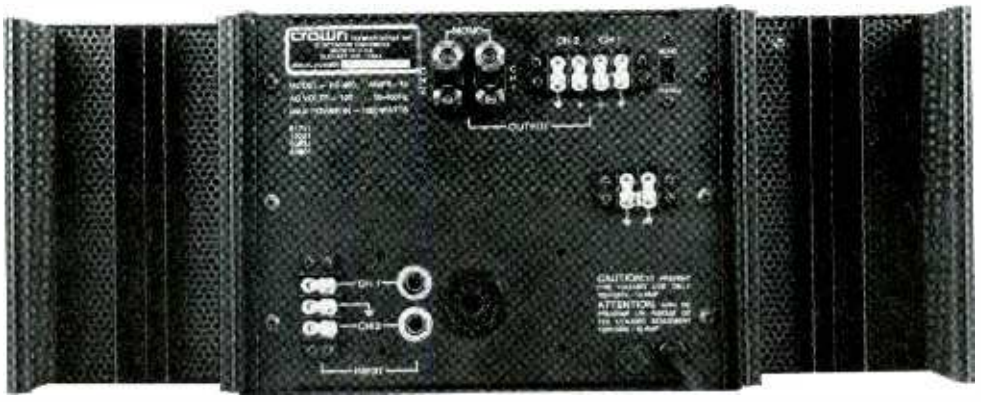

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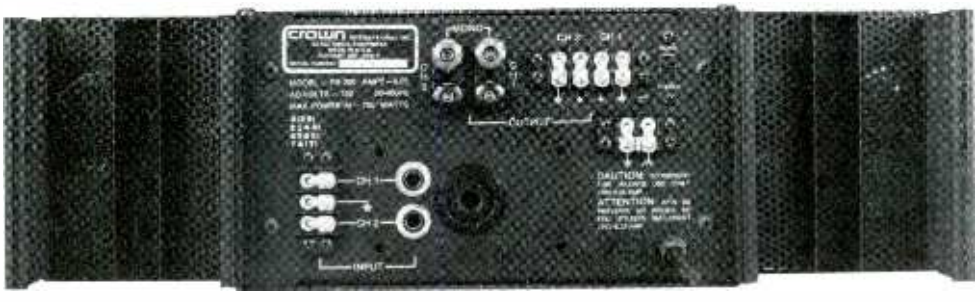

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— *continued form preceding page . . .*

Furthermore, these Leslie models are similar in that they all have components mounted in a three-compartment cabinet. The top compartment houses the rotating high-frequency horn; the middle "box" the high- and low-frequency drivers and crossover (and which also acts as a vented box for the low-frequency driver); and the bottom compartment the low-frequency rotor and amplifier. Louvres located in the top and bottom compartments let out treble and bass sound respectively. All the above speaker systems are virtually identical in terms of their use and sound quality. (The larger Models 147 and 122 allegedly have a better low-end.) Both high- and low-frequency speakers operate on the same principle: a stationary driver (loudspeaker) and a rotating acoustic "projector."

The "Treble Rotor"

The Leslie's high-frequency unit is largely responsible for the "Leslie Sound." Some organists actually find that the bass rotor's slower response to speed changes is distracting, and will actually disconnect the bass rotor drive — especially when playing a bass line. The treble unit consists of a stationary ¾-inch throat Jensen compression driver, connected to a vertical tube that acts as a thrust bearing (Figure 1). A twin-bell, molded black bakelite horn, which starts vertically but flares horizontally, sits on this bearing/tube, and rotates via a two-speed A.C. induction motor fitted with three (selectable) drive pulleys. This motor drives the treble horn at fast or slow speeds via a drive belt and belt tension spring. Direct current is sometimes applied to the "fast" motor so that it will slow down more quickly; this is called a "D.C. brake." The treble horn actually looks like two horn assemblies; in fact, only one is operable as a horn. The other side, a "dummy," acts as a counterweight or dynamic balancer, providing symmetric air drag at high speed. The resulting structure rotates smoothly and without eccentric "wobble" forces.

At the mouth of the horn is a diffuser cone, which is supposed to widen the dispersion of the horn and make a "more musically pleasing tone." Actually, it does work. Figures 2 and 3 show typical polar response charts of a Leslie Horn with and without the deflector; the results are dramatic. The "without" curve of Figure 2 is typical of a "beamy" straight horn, with a lot of sound concentrated on-axis and very little sound off-axis. The "with" polar response curve of Figure 3 is almost omnidirectional; note, however, the "lobing." As the horn revolves, the sound will actually rise and fall a number of times, giving it an even more characteristic sound.

The horn's so-called coverage angle is taken from polar response charts such as these: it is the included angle between -6 dB points from the horn's on-axis level. Figure 4 and 5 show such coverage angles, compiled from a series of third-octave polar response curves. Note how the beamwidth gets smaller and smaller without the deflector. This means that if the deflectors are removed the sound will be much hotter on-axis, but much softer off-axis. Therefore, the A.M. portion of the Leslie Sound will be much more severe and "choppy," as many a rock and roller will tell you. Many Leslies played in clubs are faced backwards, with the top and bottom rear panels and deflectors removed, because the sound "cuts" better; an effect that translates as, "You can hear it better over the guitar player."

This beaming process will actually raise the on-axis sensitivity of any driver, as can be seen

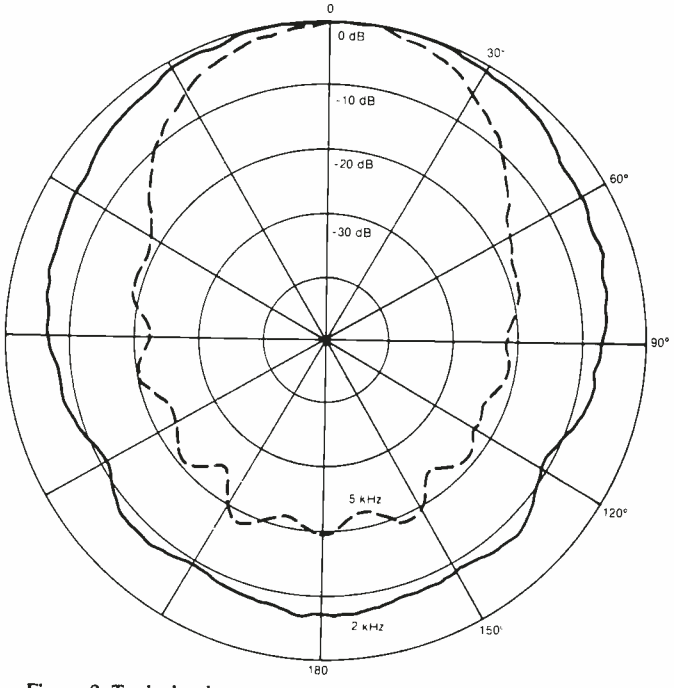


Figure 2: Typical polar response patterns of the Leslie Treble Rotor, with the deflectors removed

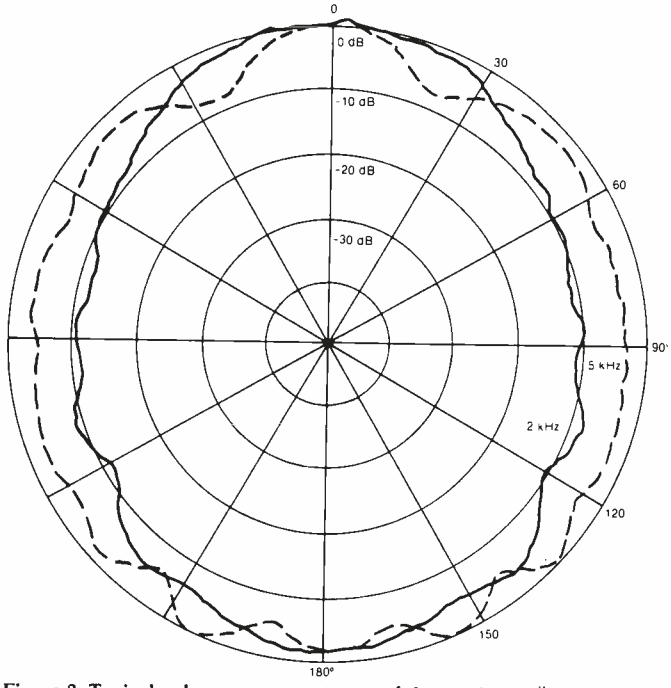
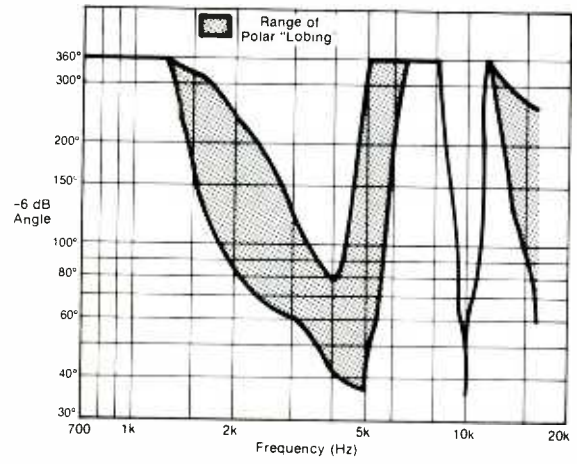


Figure 3: Typical polar response patterns of the Leslie Treble Rotor, with the deflectors in place



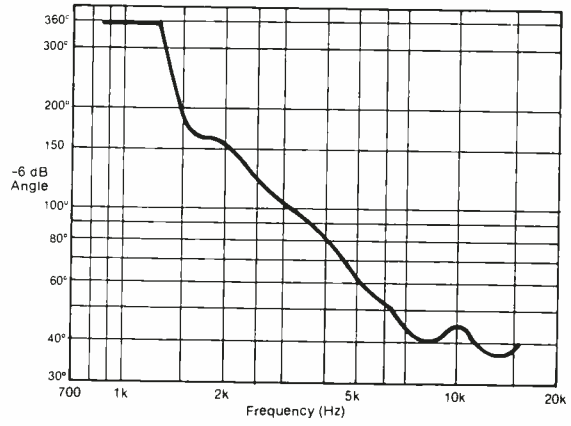


Figure 4: (left) Coverage angle of the Leslie treble horn, with the deflectors in place. Figure 5: (above) Coverage angle of the Leslie treble horn with the deflectors removed.

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Q: There are lots of digital delays around. Why is the Eventide H949 Harmonizer different?

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Although "pitch ratio" is a mathematical concept, it has a very real meaning to the recording engineer. In effect, changing pitch is equivalent to retuning a musical instrument. This true pitch change, as produced by the H949 is far different from common ring modulator effects because Eventide Harmonizers preserve all harmonic ratios. As a result, even at wide pitch-change ratios, the modified signal still sounds musical. Pitch-changed signals can be mixed with the original to create chorus and harmony effects. You can change the perceived speed of a tape without changing the running time, or vice versa, and you can create continuous "doppler shift" effects (will that train whistle ever go by?)

True pitch change is also a far cry from the pseudo-pitch change which other digital delays obtain by changing the clock frequency. Any DDL can do this for a very short time (milliseconds at most.) But it does this at the expense of continued operation. For instance, raising pitch implies reading data out faster than they are read in. That's easy; just speed up the clock. Except that to maintain pitch, you have to keep doing it. The DDL quickly runs out of data and then where's your signal? Eventide Harmonizers contain circuitry to allow audio to be "read in" and "read out" at different rates. This provides the ability to set your output pitch up to an octave up or two octaves down with precision on the H949.

Q: What are glitches? How can I get rid of them?

A: If you followed the above answer, you'll realize that something must be done when reading data in and out at different rates, or there will be too much or too little data! What we do, in effect, is to "splice" literally removing or adding very short segments of program to make up for the missing or extra data. And, just as you would when splicing a tape, the Harmonizer makes a "diagonal cut."

While the diagonal cut eliminates sharp transients, it's still possible to get minor imperfections, known as "glitches" in the output. Depending upon the pitch ratio, the program material, and the prominence of the signal in the final mix (i.e. lead vocal or buried horn) this "glitching" can range from objectionable to unnoticeable. Eventide's research has developed ways to substantially eliminate the pitch-change glitch. We do this by carefully selecting each "splice" point, much as a human tape editor tries to match the signal or silence before and after his cut. This important development (the "De-glitch card option") is now available on new H949 Harmonizers, and can be retrofitted to all H949's.

Got a question about digital effects? Write to "Ask Eventide" 265 West 54th Street New York, N.Y. 10019. Questions of general interest will be answered in this column. If we use your question, we'll send you an Eventide T-shirt, so include your size.

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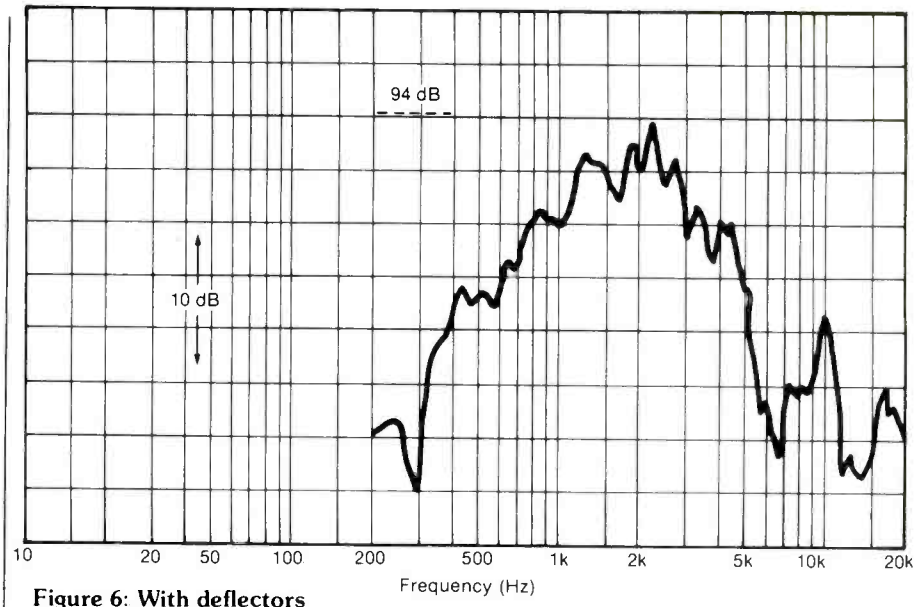

Figure 6: With deflectors

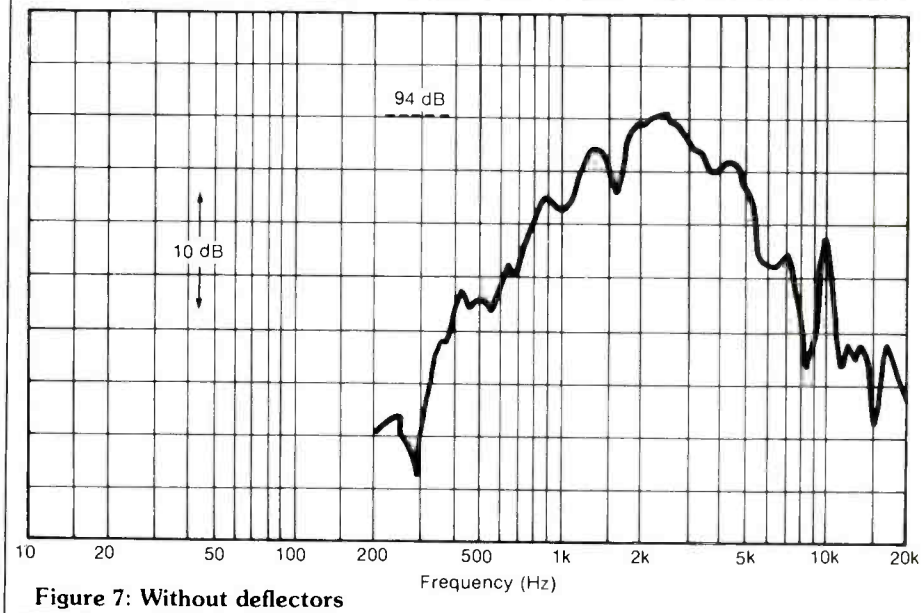

Figure 7: Without deflectors

from the frequency-response curves of a University ID-40 driver (a respectable, but typical ¾-inch throat PA unit) mounted on a Leslie horn with and without deflectors (Figures 6 and 7). It is interesting to note the extra sensitivity above 1.5 kHz available without the reflectors in place. (Note also that the low-end — 800 Hz to 1.5 kHz — response isn't affected by removing the reflector, and that the response is ±5 dB from 400 Hz to 10 kHz. This latter range could be made even flatter with a real-time analyzer and an third-octave equalizer in the studio.)

Now, this entire discourse is based on the treble horn measured in an anechoic or non-reflecting, highly absorbent room. In real life, the horn mounted in a louvred wooden box, which means that the picture changes somewhat with resulting internal reflections. The diffuser cone does another important thing: it shifts the apparent sound source position on the horn. With the cone *in*, more of the entire range of the horn will appear to come from the mouth of the horn; with it out, however, while lower frequencies still appear to come from the mouth, higher and higher frequencies will appear to come from progressively further down the throat. They therefore appear to be rotating at a *smaller* radius, which results in *less* frequency modulation effects. (If the directional sound source was rotating at dead center, there would be no F.M. effect at all.) So here you are faced with a choice: leave the deflectors in place and the result will be maximum frequency modulation, and a relatively lower amplitude modulation, because of the very wide directional characteristics of the horn. Take the deflectors out though, and the F.M. will be lost, but you obtain very strong A.M. — especially at higher frequencies — due to the very narrow beam width of the naked horn. My own ears tell me that the deflectors should be kept on, but you make your choice and you take your chances!

The "Bass Rotor"

In the lower compartment of the Leslie box is a rotating wooden drum mounted on a vertical shaft, and covered with a black scrim cloth, which provides lower aerodynamic drag on the drum at fast speed (Figure 8). It also works. At the drum's center is a cylinder fitted with a "scoop" which, as in the treble unit, starts vertically (the bass driver faces downward into its entrance) and projects sound horizontally. The drum assembly is driven with a two-speed

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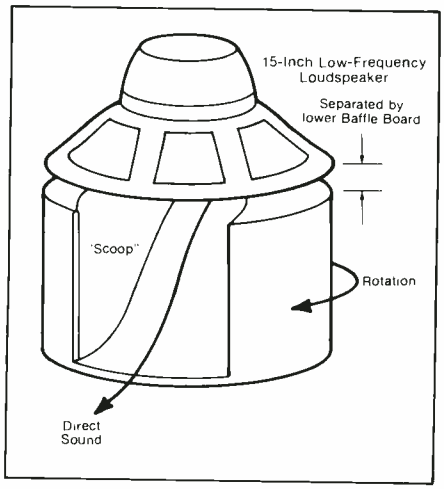

Figure 8: The Leslie Bass Rotor

motor, and ends up at approximately the same rotational speed as the treble unit. The only difference is that the drum's inertia makes it approach final speed over a much longer time period. A D.C. braking voltage can also be applied to the "fast" motor to slow down the speed more quickly when switching from fast to slow. This system works somewhat effectively.

To my ears and powers of reasoning, the bass rotor works just as an A.M. device, and only for the upper two octaves or so of the bass section (200 to 800 Hz). Frequencies lower than 200 Hz are probably uneffected by a scoop of this size, since 200 Hz has a wavelength of approximately 5.5 feet. There may be some frequency-modulation effects near the 800 Hz crossover point, but it sure *sounds* like A.M. to me. The result is a low-frequency "throb," which is very pleasant and especially powerful and beautiful when used in "slow" or "chorus" mode.

The Complete Leslie System

With all these rotating components installed in the box, the System works as follows: an electrical signal is sent into the Leslie amplifier driving a 12 dB per octave, 16-ohm crossover, which feeds the 16-ohm bass and treble drivers with the appropriate frequency bands (Figure 9). Input signal, motor controls, and A.C. line voltage (115 V, 60 Hz) are connected to the unit via special plugs and sockets, linked with the "Leslie cable;" it is this latter cable that's a major problem for many who would like to use a Leslie. Most self-contained speaker systems have an A.C. cord that plugs into the wall, and an input jack for the music signal. The Leslie, however, has a "Leslie Cord." Just one of the things with which we Leslie fans have to live.

The amplifier chassis contains a 40-watt amp fitted with 6550 tubes — a *wonderful* choice of output tube for instruments — and motor control circuitry. Each rotor is actually driven by two separate motors (fast and slow) mounted in one package. Therefore, there are a total of four rotor motors and four pairs of wires, which all plug into the amplifier chassis. If any of these wires are removed and plugged into a live A.C. outlet, the appropriate motor will turn on safely without any problem, since this is essentially what the motor control does.

Input to the amplifier is via the six-pin plug. The speaker and crossover are both connected by very odd little two-pin connectors that I have never seen in use outside of a Leslie Speaker. They work, however, and seem to be very reliable over long periods of time.

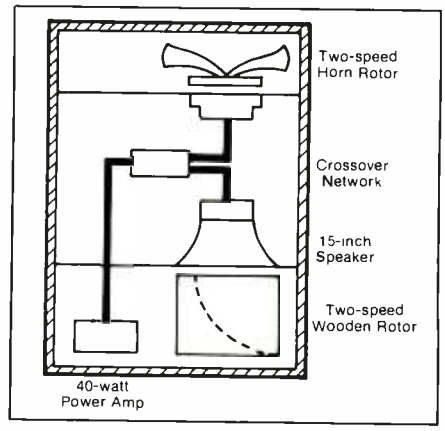

Figure 9: Schematic diagram of the Model 147 Leslie Speaker System

Getting Music In And Out Of A Stock Leslie

Picture the scene. You have just bought a used Leslie; you got a great deal on it just in time for the gig. You excitedly load it up, set up your Farfisa organ and then stare dumbfounded at this ugly, black 6-pin Harvey-Hubble *plug*, the only connector visible on your Leslie. Your ¼-inch phone plug cord hangs limply in your hand. . . useless . . . impotent. Mistress Leslie stares back coldly. You can't even plug it in the wall and watch the tubes glow!

Chorus Interruptus . . . The Horror!

Well, it's a real problem. But, *veehaff vays to do ziss, Fraulein Leslie.* Here's how.

If your studio has a Hammond B3 or C3 organ with a Leslie attached, the latter will probably be a Model 22 or 122. This is a quiet, reliable and troublefree system, although you still can't plug it into the wall and operate the Leslie *independently of the organ.* Most big Hammonds, like the B3 and C3, will have a Leslie plug installed on them. Be careful! Only connect a Hammond Organ to a Model 122, 22, or 122RV; *never* connect a Hammond via a "Leslie Cord" to a Model 147 ot 145 Leslie. It will basically blow up. Inside the organ a very simple connection can be made via the RCA phono jack fitted to the "expression control box." This jack can be located by taking the back off the organ and merely plugging in. It is a line-level input that will accept most relatively high impedance signals.

A recent welcome accessory to the Leslie line is the Leslie Combo Preamp. These little beauties actually boost the signal of an instrument to the required level, provide A.C. power for Leslie's amplifier and motors, and have foot switches to change speeds. It also plugs into the wall (via a *real* A.C. cord), connects easily to most instruments (a *real* ¼-inch phone jack), and attaches the preamp to the Leslie via the standard Leslie Cord.

You may want to build a customized system for your own special use from a stock Leslie 147 or 145. (You'll *probably* want to modify it — this comes later.) Any modifications that involve poking around within the power amplifier should be carried out with *extreme* caution. Remember that the Leslie speaker is fitted with a *tube* amplifier, which has a power supply voltage of over 400 V D.C. I've heard that, if you're a player, such a shock can improve 128th note runs, but I wouldn't recommend it. Watch where you put your fingers!

Engineering your own system is actually a simple matter, once you can locate a 6-pin plug that is compatible with the one fitted to the amplifier (or buy a Leslie Cord). Pin 1 is signal ground, and pin 6 signal "hot." Any source

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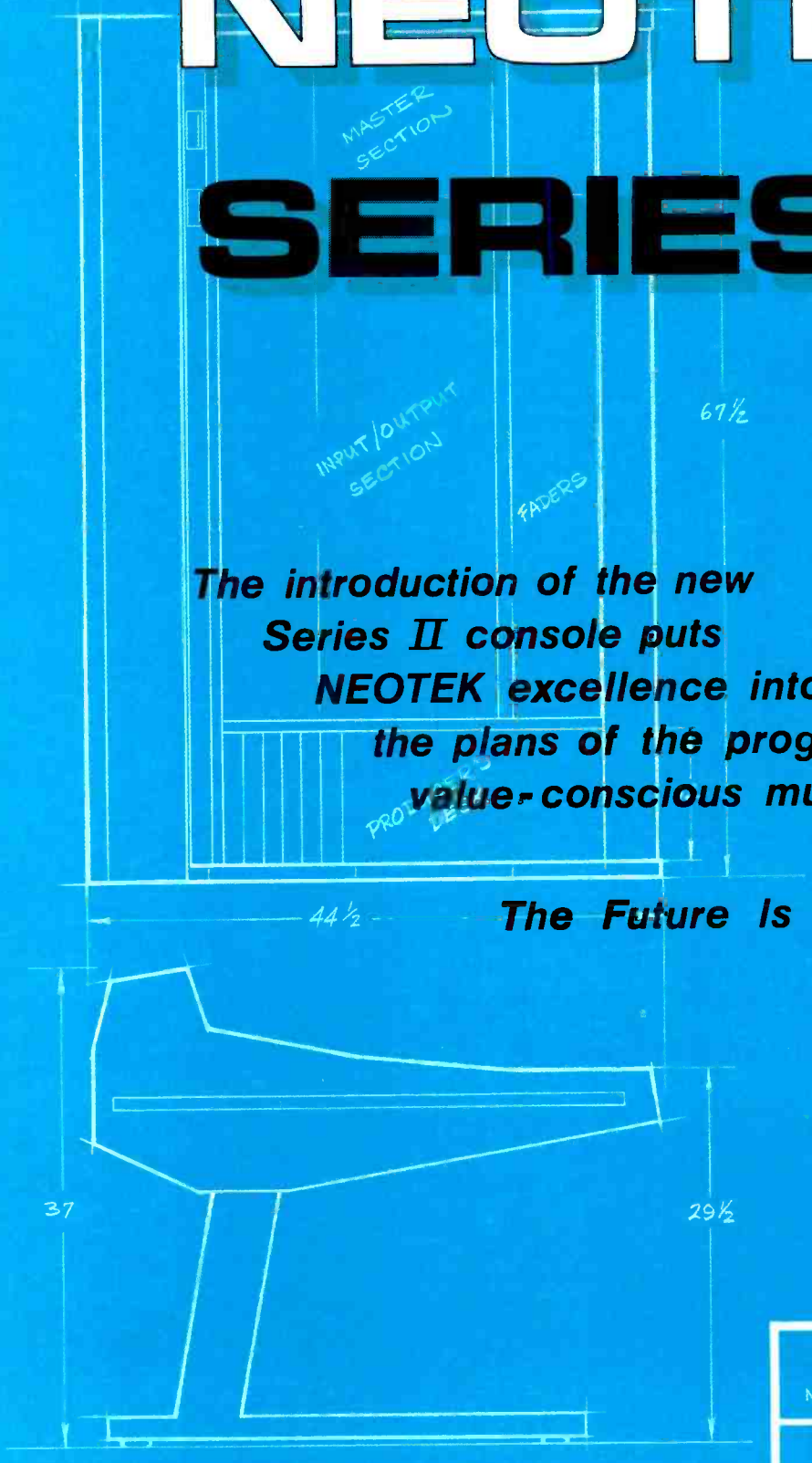

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capable of delivering over 6 V into a load of 2.5 kohm, or less, will be able to drive the Leslie amp to full power with the "console load resistor switch" set to "open." The switch also inserts an 8-ohm, 10 watt or 16-ohm 10 watt equivalent resistor across the input, which means that a 10-watt power amp could be used to drive the Leslie, with the level control at the right setting. This is the typical setup for many organs equipped with their own power amps. A small guitar amplifier, such as a Fender Champ would do fine. The speaker should be disconnected, and the switch set to "8 ohms." Don't try it with a large power amp, however; your Leslie will sound, and smell, very bad shortly after the input resistors burn up.

Input power (115 V A.C.) connects via pins 3 and 4. Pins 2 and 5 connect the 115-Volt A.C. coil of the tremolo relay, which is "fast" when off, and "slow" when on. Therefore, a D.P.S.T. switch connecting pin 2 and pin 3, and pin 4 to pin 5 will activate the relay; if you only want "fast" forget pins 2 and 5. (A simpler approach would be to make a direct connection from pins 4 and 5, and use a simple S.P.D.T. switch.)

Modifications To The Leslie

Ah, yes; audio racing in the streets. Imagine thousands hearing a vocal track through a Leslie . . . a Leslie that can be heard over a guitar player's Marshall Stack . . . a clean, Hi-Fidelity Leslie. These things and more can be yours, given the cash outlay in proportion to the desired grandeur, and even more cash if you don't build it yourself. (This country is loaded with local Leslie "speed shops" — and there will probably be 50% more after this article is published.) Electro Music makes Fenderesque Bi-Amp Leslies in vinyl cabinets. However, they are expensive, and are only equipped with amplifiers rated to a maximum of 60-watts. Also, you may very well want to preserve the present walnut beauty and improve its performance. If so, here's how:

External Mono-Amplification

The stock Leslie Models 145, 147 or 122 have a marvelous 40-watt tube amp. When you *really* lean on it, it sounds even lovelier, with a warm rich distortion like nothing you've heard. The show organist at Circus-Circus, Las Vegas has the best sound of this kind I've ever heard. He runs his Hammond B3 on 10, and just keeps the hammer down. However, in a live band situation or a club, or worse, at a concert, even a single 40-watt Leslie just doesn't cut it, even for a keyboard only. The recent rapid expansion of concert sound techniques allows quieter instruments to be miked and simply turned up at the console. I'm told that Keith Emerson and others have actually installed and miked a Leslie in an isolated backstage room during their concerts. (Including Bruce Springsteen's keyboard player, Danny Federici; *R-e/p, February, 1981 — ed.)* The result is a clean Leslie sound with no on-stage bleed from other instruments. In many cases however, a performer prefers more direct level from their own instrument.

The simplest way of enhancing the sound of a Leslie is to disable the built-in amplifier (pull out all four tubes and/or the fuse) and use the motors only, via a combo preamp or the adapter discussed earlier. The speaker system can then be connected to whatever amplifier you plan to use. This is achieved by disconnecting the crossover from the standard Leslie amplifier, and patching it to a convenient input socket. A ¼-inch phone jack, or a much-better-butlessstandard banana or GR plug would be the answer. A more versatile method would be a ¼inch jack which, when accessed, disconnected the crossover input from the Leslie amp, and connected it instead to the jack. The only problem remaining is the power handling capability of the Leslie Speaker System components, namely the high- and low-frequency drivers and the crossover networks. I'll discuss these as separate modifications.

Treble Driver Modifications

The stock Leslie high-frequency driver is pretty fragile, and is easily overloaded with a stock 40-watt amplifer. Unless for some exotic reason you want to drive it at low levels, plan on a new driver. Choice of drivers is important, and the most expensive ones are not necessarily the best answer. The most expensive professional drivers from Altec, JBL, Electro-Voice, and others, have usable sound reproduction to within the 10 to 20 kHz octave. Such performance probably won't be needed for a Leslie — I'm told that, in fact, a very high frequency harmonic content is actually a deterrent.

Extended-band high-frequency drivers are also rather fragile; a percussion note from a Hammond B3 can easily send a 0.002-inch thick aluminum diaphragm through its full excursion, and into the driver's phase plug. At this point, the musician is off the air, possibly during a now

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favorite solo, or in the middle of a take. Also, these drivers have large throats (between 1.4 and 2.0 inches in diameter), whereas the entrance hole to a Leslie treble horn is about ¾-inch. This makes it ideally suited for the ¾-inch throat PA drivers fitted with screw mounts, such as those made by University, Electro-Voice, Atlas, etc.

Such drivers are relatively cheap, can easily reproduce up to 5 or 6 kHz, and some handle enormous amounts of power. They also have a very similar bandwidth to the stock Leslie driver, which means that the same sound quality will be maintained. Actually, replacing the treble driver would make a stock Leslie much more reliable for "leaned on" use. My own personal preference is the Electro-Voice 1829 driver, a 16-ohm unit ideally suited to the Leslie crossover. I used one on stage for years at full chat with a Bogan MO-100A 100-watt tube power amp. It's still intact and has a pleasing sound. I'm told by numerous others that they have had similar good luck with an E-V 1829's sturdiness and power-handling ability.

Replacement of the Leslie driver involves first removing the backs from the upper and middle cabinets to provide access to the driver and horn. A special adapter is necessary to fit the screw throat PA driver to the stock Leslie horn, as shown in Figure 10.

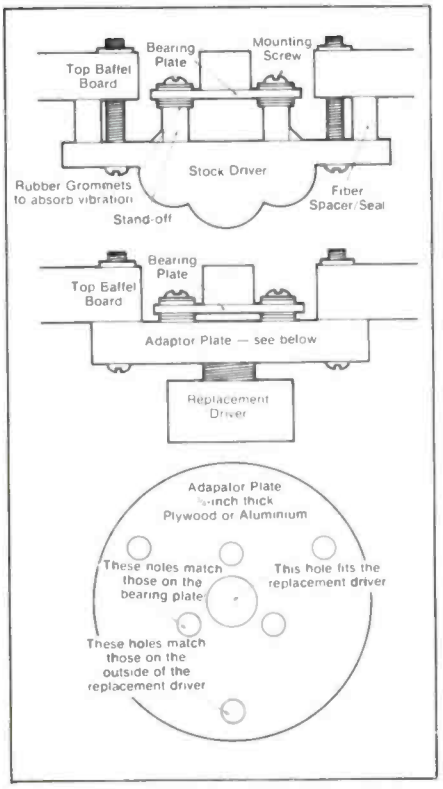
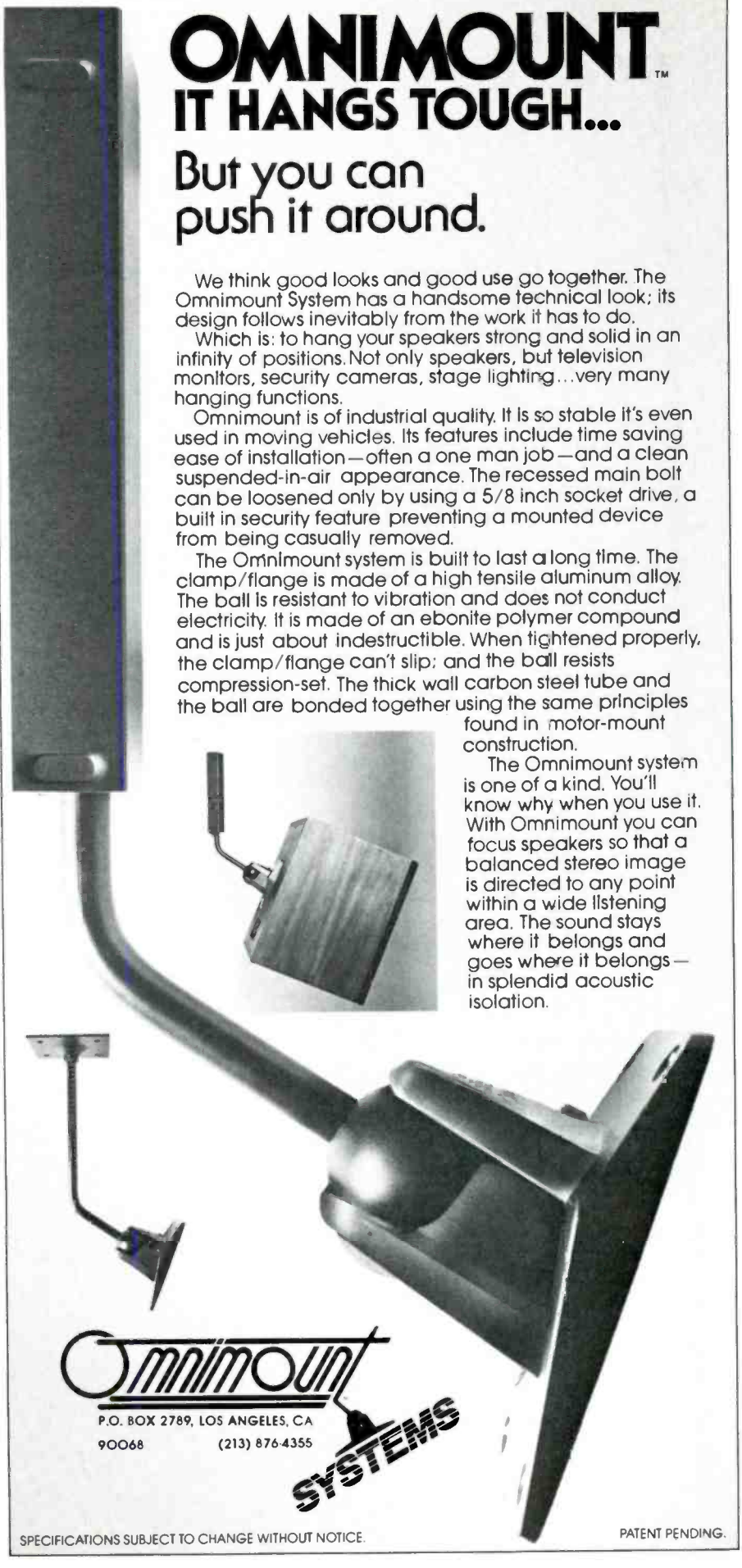


Figure 10: High-frequency driver modifications. Top: standard driver and adaptor plate. Center: changes necessary to accommodate replacement driver. Bottom: layout of special adaptor plate.

Bass Driver Modification

The stock Leslie Bass Driver is a 15-inch O.E.M. speaker capable of handling about 50 watts. Supply it with 40 watts of a 30-Hz pedal tone and it shakes a lot; you may also be getting dangerously close to the driver's excursion limit, but it seems to be pretty sturdy. I've certainly heard of them breaking with "stock" use. If only a keyboard is used through the system — one without a lot of deep bass — and you protect the driver by filtering out the low-end, the unit may handle lots more as you



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UNEARTHING THE MYSTERIES

OF THE LESLIE CABINET

approach its "thermal limit." If you want to avoid running the risk of breaking the bass driver, the easiest solution is to repiace it with another unit capable of handling higher loads. Speaker choice is left up to the individual; since it's a matter of taste I can't really recommend any. An 18-inch speaker will fit with the following modifications: a spacer ring has to be added between the speaker and the Leslie baffle (so that the cone doesn't *hit* it), and part of the back panel may have to be whittled out for certain larger 18-inch speaker frames.

Crossover Modification

The stock Leslie crossover is a 12 dB per octave, 800 Hz unit requiring both 16-ohm high- and low-frequency drivers for correct performance. Most "mondo-power" 15-inch woofers have an impedance of 8 ohms, which tends to extend the response a bit higher than 800 Hz. Although this shouldn't cause any difficulties, it *will* make an 8-ohm high-frequency driver extend a bit lower, which will definitely cause excursion problems. The answer is to either buy a 16-ohm replacement driver, or perform the following modifications.

If the Leslie is fitted with both 8-ohm high- and low-frequency components, a stock 800 Hz crossover can be obtained from JBL, Altec, and other manufacturers. Community Light & Sound makes a very good crossover, which requires an 8-ohm bass speaker and a 16-ohm treble speaker (if you use it without its attenuation pad). The crossover handles well over 200 watts RMS, and is made from aircore coils and Mylar capacitors. Besides being a true "hi-fi" crossover, it would make an excellent choice for a super-power system. It is also possible to design and build your own crossover network from drawings and circuits published in any of the audio textbooks and cook books.

The best, most versatile and most adjustable solution would be to biamplify the Leslie. Again, it's "art," right? A Crown VFX-2 and stereo power amp would be a great setup with which to experiment.

Lastly, a crossover network consisting of a single series capacitor is a possibility (20 microfarad for 8-ohm units, and 10 microfarad for 16-ohm). It allows full-range sound to pass to the bass speaker, and high frequencies above 1 kHz to the treble speaker with a 6 dB per octave rolloff. Such a crossover network has been used successfully, and produces a very interesting and pleasing sound.

Microphone-Prepared Stock Leslie

This technique has been used very successfully in a live-music situation. A pair of small electret lavalier microphones are permanently fastened to opposite corners of the treble horn compartment. Output from these mikes is connected to an external stereo mixer equipped with equalization — hopefully by a permanent connector fitted to the back of the Leslie cabinet — and hence to a stereo power amp and a pair of speakers located on either side of the stage. If a stereo PA rig is being used, the mikes can be fed into two channels of the front-of-house board and panned left and right. As with anything, "good taste" in EQ and general technique is required to achieve a good sound. Actually, bad taste might work well, too; try both.

Wind noise from the horn is not a problem, and minimum mechanical isolation is needed. Lack of wind noise is probably because the cabinet corners are "stagnation" or dead-air spaces. Wind noise, if present, can be reduced by using an open-cell (reticulated Scottfoam) wind screen on the mikes.

An obvious extension of this mike technique is to do the same with the lower rotor, and obtain a mixed top and bottom left and right sound. Apparently, the "top-only" technique works very well in a live situation, but might also serve the purpose for a studio Leslie.

Tandem Rotors

Slower acceleration of the lower rotor is occasionally undersirable — certainly, a matter of personal preference only. To give a more dramatic Leslie sound, the top and bottom rotors can be mechanically linked so that both will turn in sync, and the pair of horns face in the same direction. Silver Sound Systems (337 South Morris Avenue, Crum Lynn, Pennsylvannia) built the little screamer with tandem rotors shown in Figure 11, which is an example of a well-prepared custom Leslie unit. It enhances the Leslie action by putting full range sound into the bass unit and only high frequencies to the treble unit. This customized unit was designed for use with electric guitars.

Motor Speed Change

A really effective means of changing the rotor speed is to reach into the treble motors, and move the belt from one of the three drive pulleys to another. (Tricky, eh?) Actually, that's what

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treble horn, with the high-end rolled off to suit. He also uses at the back of the bottom rotor a U87 with the lows rolled off, and mixed with the top mike to suit. He remembers experimenting with the top and bottom sound panned left and right, and not liking the effect.

Allen Sides *(Ocean Way Recording, Hollywood)* prefers a pair of tube U67s, located about 5 feet away from the Leslie, aimed midway between top and bottom rotors, and spaced 10 feet apart. The mikes are panned left and right, and recorded on two separate tracks. Allen prefers the U67's natural roll-off on the high-end for de-emphasizing the high-frequency distortion on top. He told me of recording Billy Preston, who played a Fender Rhodes electric piano with stereo vibrato, and sent each channel to two separate Leslies.

Joe McSorely *(Veritable Recording, Ardmore, Pennsylvania)* likes to use a pair of U87s mounted relatively close in top and bottom cabinets. For a "tight" organ sound, he rolls off the lows from the bottom rotor, but records the top flat. Joe echoes a repeating problem — wind noise up close — and he always uses windscreens on the mikes. He says that most organ Leslie recordings done at Veritable are on one track, but a great "fake stereo" mixdown effect can be achieved by panning the dry track to one side, and using a Harmonizer® in the "doubling" mode on a second track panned full opposite; Joe describes the resultant sound as "monstrous."

Several Odd Things To Try

An interesting sound results from running a full-range 15-inch speaker with a full range signal into just the bottom rotor. It should be obvious how to do this. The slow acceleration and deceleration of this massive rotor is quite different from the top unit, as is the frequency content. Try it.

There's one other item. I know for a fact that certain old Leslie Cabinets have a structural resonance in the wood and probably in the louvres; but it's the real thing. The old wood is simply more resonant, and Hammond percussion notes really set it off. (It's like these guitar players running around in South Carolina pawn shops looking for the ultimate '56 Fender Strat.) I've heard Leslies on records that just have a legendary tone to them, and others that "just play regular." Go around and knock on a few new and used Leslies — especially the louvres — and see if you think I'm crazy. Anyway, the point to this was: Why not try putting a FRAP pick-up on the louvres. Experiment — see if you can bring more of the sound out of the wood.

Specific Examples Of Normal Leslie Use

Normal Leslies are surgically attached to Hammond B3 or C3 organs; usually the former. There are many other brands of organs that have been played through Leslies during recording sessions, but "The Sound" which accompanies this great rock and roll Spirit of America is, pure and simple, a B3 and a Leslie. (Steinway piano, Fender Amp, Gibson, Les Paul, Fender Strat/Telecaster/Precision Bass — all in the same breath.) The Isley Brothers used the fast Leslie all the way through their hit

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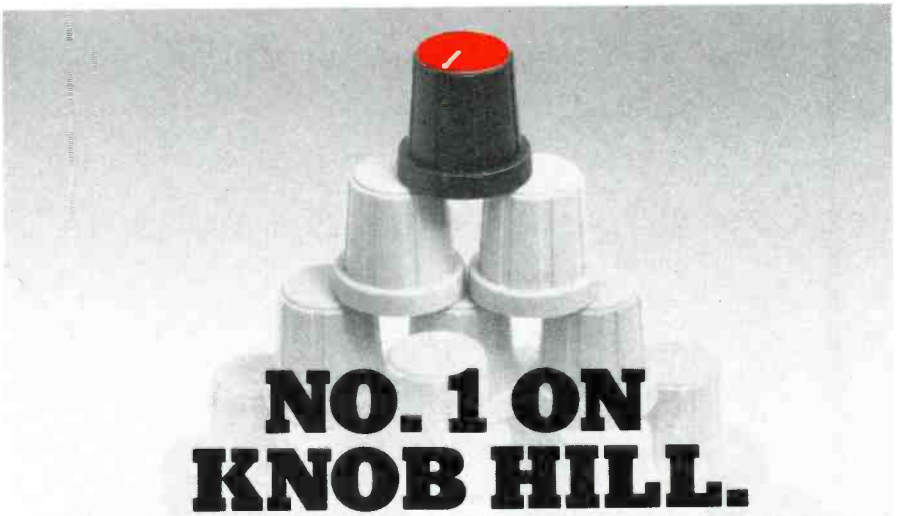

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the rotor at high speeds sounds like you have a helicopter in the room. Which is a sound you *might* want. The same thing happens on the bass rotor, where up close there is also a lot of mechanical noise. A loose scrim will be real noisy; tighten it up. The sound from both rotors is mellower coming out of the louvres. By removing the back panels and miking the Leslie from the rear, the sound is more "direct" and defined.

Stereo And Multi-Mike Recording

Use of two mikes on the top and bottom of the cabinet is a very effective way of getting a good sound, bearing in mind the A.M. effects of close-miking. The *best* way I know of recording a Leslie, however, is in stereo. The left and right channels can be recorded with either a top and bottom pair of mixed mikes, or with just single mikes panned between left and right. The stereo image achieved with two pairs panned full left and right is very exciting. Many combinations are possible though, the point being that a Leslie is capable of providing a great deal of spatial information.

I spoke with a few engineers I know about such recording techniques, and here are a few of their preferences:

Jay Mark *(Sigma Sound, New York)* has been pleased with a "tight" or "direct" Leslie sound, when recording organ. His principal reason for this is because the organ is used as background and not a featured instrument; the tight sound is needed so that the organ sound is very clear and unmistakable, even when way down in a mix. Jay has used the following setup with good results: an RCA 77DX ribbon at back of the top rotor cabinet, about 8 inches from the

Figure 11: Customized Leslie Cabinet with tandem bass and treble rotors. The stock treble horn is driven from a tandem drive shaft coupled to the lower bass rotor. An Atlas P.A. driver is connected to the treble horn, while a JBL D120 12-inch speaker handles the lower frequencies.

they are there for; you are *supposed* to do it. My own preference is the middle pulley.

There have been a variety of speed change controls made available for Leslie motors. None have been very successful, however, since they just lower motor voltage, with the result that the motor will usually draw more current and possibly burn out. Watch out for these things. Leslie motors are A.C. induction types and, since they have no brushes, will last practically forever. However, their speed is determined by the 60 Hz frequency input, which is the same problem as varying tape-drive speed. The only solution that makes any sense is to hook-up a 115-Volt variable-speed oscillator. This can be constructed from a generator and tube amplifier that has a 115-Volt output tap. (Just like the old days, Sonny.) I am told it is really not worth the trouble though — the intermediate speed doesn't really sound very good.

STUDIO PRACTICE

As with just about anything, recording a Leslie is a matter of particular taste and purpose. You might want to record the best possible recreation of a live Hammond/B3 Leslie combination; you might want to make it sound "better." You might also want to use it as send and receive device, like an echo unit, with a high level send to the Leslie Amp, and a mono or stereo microphone receive. You could put it in a studio, in a reverb room (or in the bathroom) during the mix, or you might use it live. The possibilities are only limited by your level of creativity and/or insanity. However, the following are some standard techniques and descriptions of behavior.

Mono Recordings

I have recorded Leslies with a single microphone mounted as close as 1 foot from the treble horn, with very pleasing results. If the mike is placed even closer (within several inches) the severe amplitude-modulation effect becomes very annoying, and wind noise from

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"Shout." Gary Brooker combined America Soul, European Bach and B3 lower drawbars through a continuous slow chorus Leslie, and made millions listen to a "Whiter Shade of Pale" with its gorgeous organ theme. Billy Preston, Booker T. Jones and Felix Cavaliere made an art of timely speeding up and slowing down of the Leslie rotor.

These great artists (and many more) pioneered holding single notes (usually the root of the chord) and letting the Leslie provide the dramatics in rotor acceleration; synthesizer players today *still* haven't found something as exciting. Lee Michaels had hits and toured for a long time with only his B3/Leslie and drummer Frosty. The right players could make a Leslie talk, make it scream, and make you want to dance. The list goes on forever.

. . . And
Deviant Leslie Use (And Abuse)

Steppenwolf organist Goldie McJohn was able to coax an amazing sound from a stock Leslie. He connected the stock bass speaker directly ("full range") to the stock amp and ran the thing flat on 10 (actually it sounds like he found a way to get "11"). You can hear this very clearly on that classic track, "Born To Be Wild." The organ solo features the glorious distortion of a grossly overdriven Leslie amp, and you can hear the big bass rotor slowly speed up and slow down throughout the take. I saw Steppenwolf live at the now physically non-existent Electric Factory in Philadelphia. Goldie used the same setup on stage, only he stacked a bunch of them up right next to him, and miked one though the PA system.

Jethro Tull's *Benefit* album is considered by some to be the prototype Leslie-processed statement, and the hit "Teacher" from the LP is typical. Ian Anderson put both his flute and vocal through a Leslie, as did guitarist Martin Barre. It sounds like the Leslie was kept far away from distortion, a good example of a clean Leslie processing. I wish I know more about the particulars of this record, since it's another classic heavy.

Guitars Through Leslies

Many guitarists have used Leslies to modify the sound of their instrument. One unusual and very successful instance was Rusty Young of Poco. Rusty achieved some marvelous sounds with Poco by putting his steel guitar through a Leslie, producing a very distinctive and attractive effect. The instrumental line in Player's recent hit, "Baby Come Back," and J. Geils' soulful intro to "The Usual Place" are some more typical but outstanding examples of tasty Leslie guitar. I'm sure your lists contain a lot of others.

Personal Madness

I am arranging and putting together this article using a Norelco Dictating Machine, which has a microphone at the end of a coil cord that also acts as a loudspeaker. You can push a button on the recorder and the sound will come out of the microphone end. By grabbing the microphone by its cord and swinging it in circles, this entire article can be played back to me with a very strange and mysterious Leslie-like effect. It's really okay. No . . . I'm really allright. It's just like a Leslie, you see . . .

Acknowledgements

Thanks to Ralph Brownlowe, Robert Rankin and Ed Sciaky (WIOQ, Philadelphia) for some priceless and valuable information used in the compilation of this article. □□□

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career opportunities ...at audiotechniques

Continuing expansion has created immediate openings in our New York City office for the positions that are described below. Please reply by letter only, enclosing a resume of your experience and qualifications.

BROADCAST SALES ENGINEER
For our new broadcast sales department we will hire a technically qualified person with at least three years broadcast engineering experience in AM/FM. TV and/or sales experience also helpful. Some travel thru Northeast to demonstrate MCI tape recorders and other equipment to broadcast users may be required.

AUDIO TECHNICIAN
Our Audiotechniques Rentals division requires a technician with several years maintenance experience in recording studios or radio stations. Ability to check out, trouble shoot and make minor repairs on various pieces of audio equipment is required. This job would be attractive to someone in Radio-TV repair desiring to move into professional audio.

Reply by letter only to Hamilton Brosious, President.

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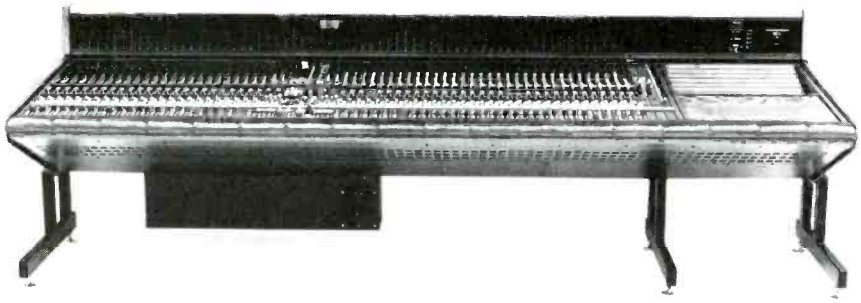
New Products



MCI JC-500D SERIES PROFESSIONAL RECORDING/REMIXING CONSOLE

Decended from the earlier JH-500's, the JH-500D Series is now available. Featuring totally transformerless microphone inputs and multitrack recorder interface, and with expanded features. Six frame sizes of 28 inputs to 56 inputs are availble. All include 32 output busses, in line monitoring with quad/stereo/mono outputs, full 4 band equalization on each input, 6 effect/foldback sends, VCA grouping with 8 dedicated group master faders, and the MCI Plasma Display featuring VU, PPM, and DC bargraph metering. Level and mute automation are optionally available.

Numerous options and accessories are available to tailor the JH-500D to any studio or application. Models are available for broadcast, or live, or direct-to-disc, usage as well as the JH-556D, the "Ultimate" console which is designed for use with dual synchronized multitrack recorders.

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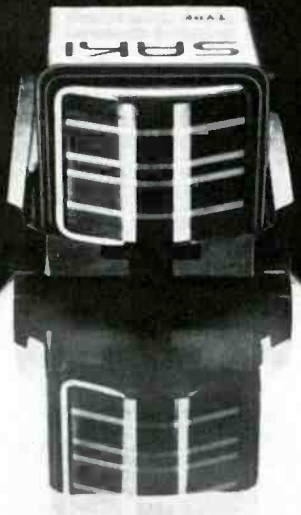

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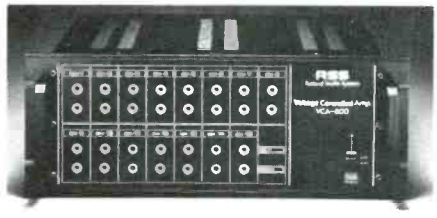
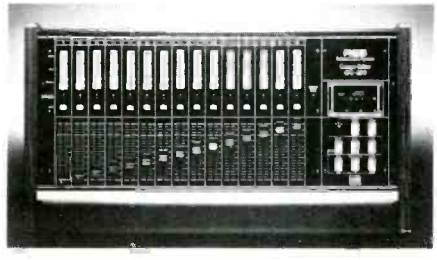
ROLAND STUDIO SYSTEMS UNVEILS CPE-800 COMPU-EDITOR AUTOMATION SYSTEM

The CPE-800 is a completely self-contained, 15-channel automation system that generates and reads SMPTE time code, and stores all its fader level and mute information in dynamic onboard memory — thereby eliminating the problems of punch-in delay experienced with tape-storage systems. Stored automation data can be offloaded for permanent storage on a conventional cassette tape, or an unused tape track. The high-speed compacted data can be off-loaded at three- to five-times "realtime" speed, dependent on the amount of fader movements and mute information to be recorded.



Since the CPE-800's VCA package is located outboard of the mixing panel, basic tracks can be recorded without VCAs at all. In recording applications, the Compu-Editor is designed to be inserted in circuit between the tape machine returns and channel inputs on a studio's normal mixing board. The small size of the unit allows it to be used in multiple studio complexes, without the problem of tying up an automation system during basic track laying.



In addition, since the CPE-800 outputs 15 channels of 0-10 V D.C., the unit could be used to control most other VCA-based systems found in automation-ready consoles.

Other applications for the Compu-Editor include audio/video presentations, exhibit controlling of lighting and audio, and any control function that can be turned on and off, or up and down, by a D.C. voltage.

The CPE-800 will store thousands of snapshot mixes for controlling level and mutes, making possible for the first time "live audio automation". According to David Hadler, Roland Studio Systems' marketing director, this is done in much the same way as programmed lighting, so that each scene is cued manually and under operator control at all times. It also offers the possibility of

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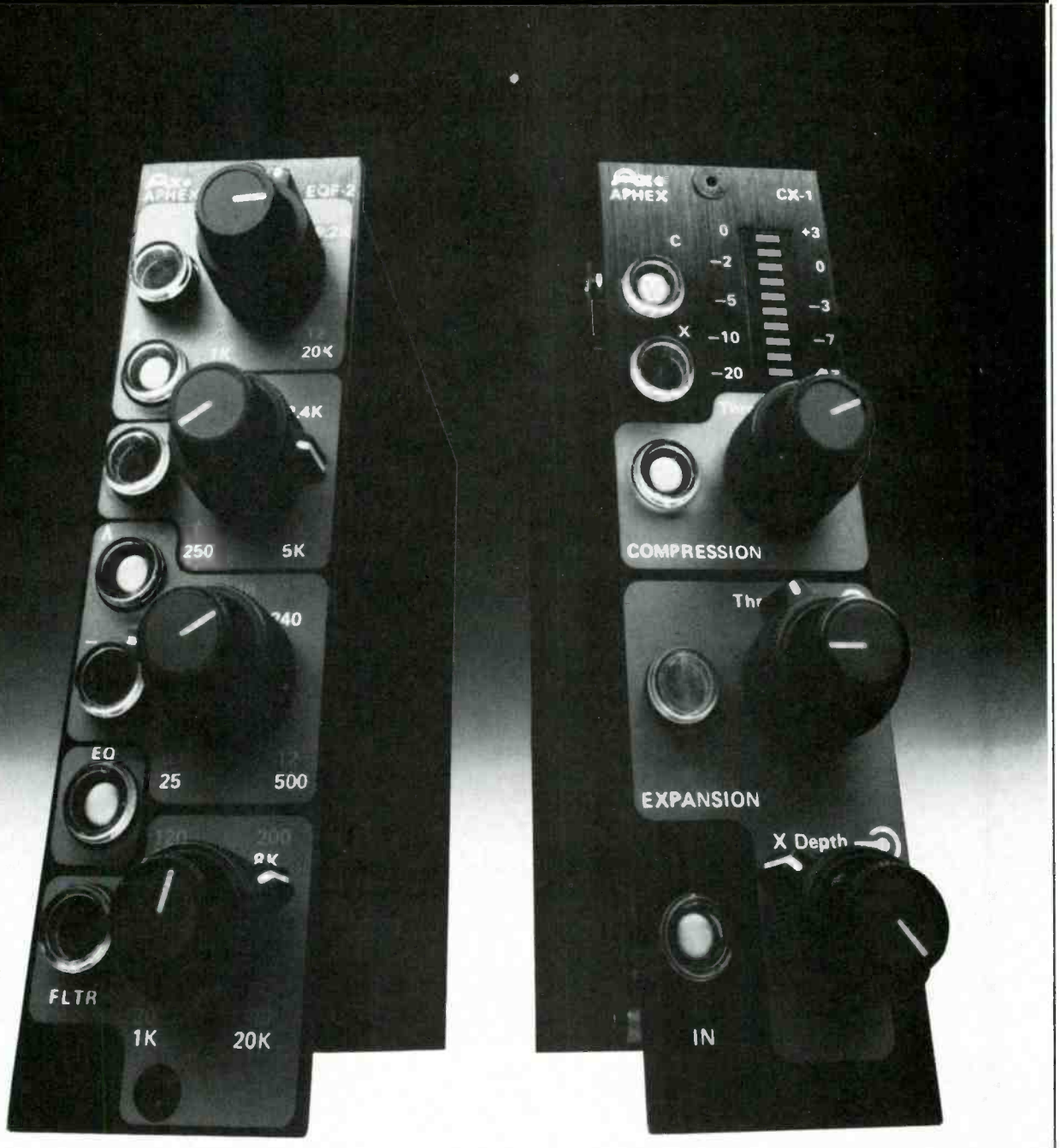

TOOLS...NOT TOYS

Already well known for its musicality and ultra low noise, the EQF-2 Equalizer/Filter packs 3 bands of sweep EQ with peak/shelf and 12 dB of reciprocal boost or cut as well as an independent sweep hi and lo pass filter section in an A.P.I. sized module. With +30dBm output capability, the EQF-2 can fix that impossible part without adding any coloration of its own.

The CX-1 Compressor/Expander offers performance beyond any similar device previously available. Total transparency, headroom to spare, up to 100 dB of expansion/gating without clicks, smooth acting "soft knee" compression and unique multi-function LED metering. It is simple to use, compact, powerful and effective.

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removing the large multi-track console from the audience area, and substituting the CPE800 as a remote-control element.

The CPE-800 Compu-Editor's compact size and low cost (just over $8,000), coupled with its innovative software, are said to open up many new applications where formerly automation was only considered an overpriced dream. The new system can be seen at the Los Angeles AES Show; booths 663 and 665.

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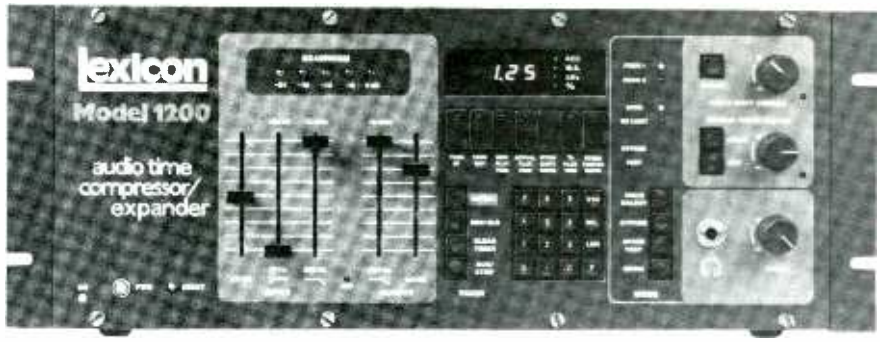
NEW LEXICON DIGITAL AUDIO PROCESSOR ALTERS SPEED WITHOUT PITCH DISTORTION



The new Model 1200 has been designed to make it possible to reduce or expand the play time of program material or commercials to meet time requirements, or to accommodate tag lines and other messages. The device is designed to eliminate the time-consuming editing and expensive re-takes now necessary to accurately fit material to specific time slots.

The unit is engineered for automatic use with variable-speed tape recorders or, for TV applications, with a variable-speed film projector/video tape recorder. Both DC servo and synchronous motor transports can be accommodated. Its comprehensive controls are human-factored to conveniently and quickly achieve the precise amount of time-compression or playback/on-air time desired. Nine non-volatile memories will store the characteristics of different audio/video transports. Proprietary digital processing techniques allow time compression of up to 25%, with virtually no degradation of audio quality. The unit features a 10-kHz bandwidth.

In addition to time-justification applications, the Model 1200 provides a way to increase listener interest and provide greater impact for recorded messages by varying playback speed. Dramatic effects may be added by speeding up program segments. Slow-paced programs can be given higher energy levels. News reports can be made to sound more brisk and exciting.

"Eighteen of the top 20 U.S. ad agencies have made time compressed commercials with prototypes of Model 1200 during its development stages. More than 150 broadcasts of these commercials and at least one prime-time full length film already have been broadcast on national TV", according to Ronald P. Noonan, president of Lexicon, Inc. "The favorable audience reception to this time compressed material, as measured in careful field tests, indicates that this new technology will become of significant importance to broadcasters and producers of taped and filmed material", Noonan concluded.

Professional user price of the Model 1200 Audio Time Compressor/Expander is $8,500.

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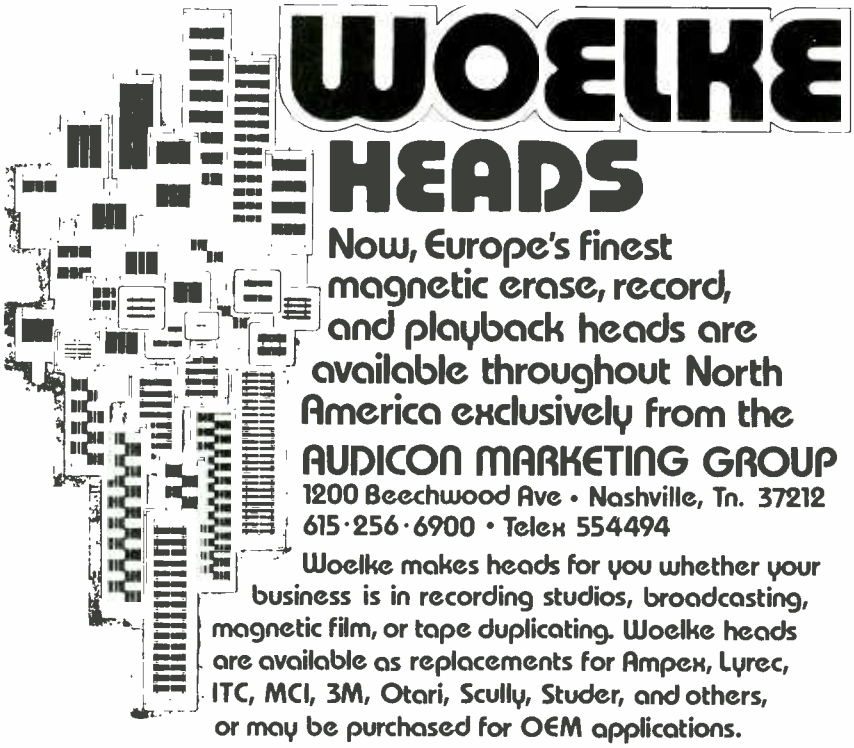
MITSUBISHI UNVEILS X-800 32-CHANNEL PCM RECORDER

The X-800, which operates with 1-inch tape running at 30 IPS, is a true 32-channel multi-track recorder: all 32 channels are available at all times for musical recording. In addition, separate, additional tracks are provided for SMPTE coding and synchronization, error correction and audio analog signals. There is even a spare channel for computer programming, and other developments of the immediate future. A built-in microprocessor provides a comprehensive range of automatic, semi-automatic and preset/memory functions. Despite its sophistication, however, the X-800 is said to be immediately operable by anyone who has ever operated an analog multi-channel recorder.

As well as offering a full 32 channels for musical recording, the X-800 multiplies their effectiveness by the immunity of PCM recordings to signal degradation. Mix-down routines can be repeated just as many times as necessary, and any number of channels temporarily relocated on any convenient tracks, without a second thought for the effect on audio quality. With today's multi-microphone techniques and split (or serial) sessions calling for the effective use of every last track, the X-800 is said to offer new levels of convenience and flexibility to assist the creative mixing engineer.

Sync Recording: Sync recording also presents no problem to the X-800. Although recording- and playback-head assemblies are physically separated, both signals are synchronized within microseconds by means of a special digital buffer memory that delays the leading signal by precisely the right amount.

Punch-In and Punch-Out: Real time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Also available from AUDICON is the full range of Woelke test instruments, including flutter meters, wave analyzers, distortion meters, and more.
See Woelke heads and test instruments at booth 104, L.A. AES May 12-15
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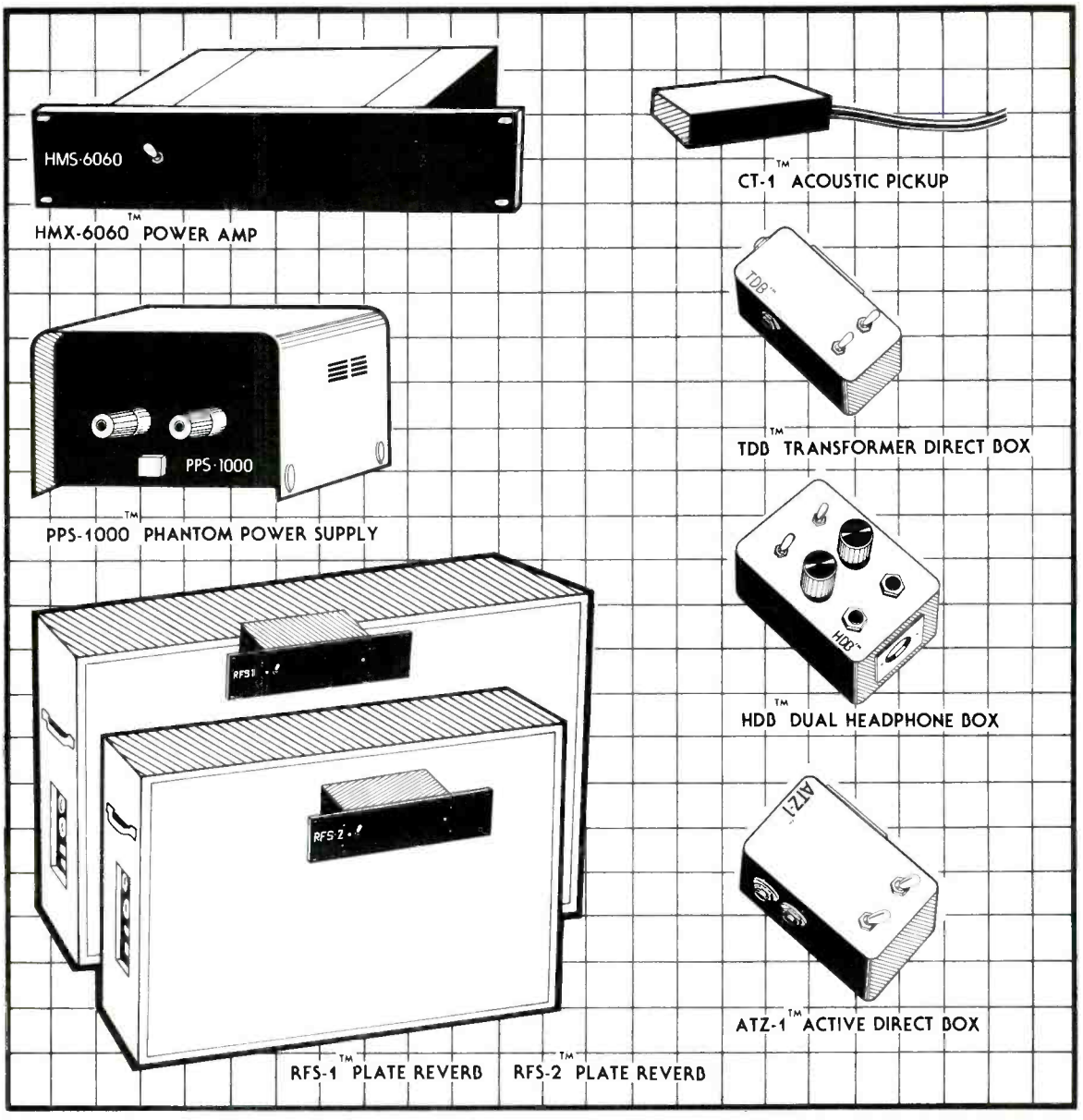

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editing is a critically important feature of multi-channel recording. To avoid obtrusive click noise that affects crude direct-coupling punch-in and punch-out (where the new PCM signal directly replaces the corresponding section of the previous take), the X-800 uses an automatic cross-fade function. A built-in computer notes the punch-in command, and automatically begins precisely balanced fade-in and fade-out just before the changeover point. Joins are said to be completely inaudible, and absolutely no click noise is generated.

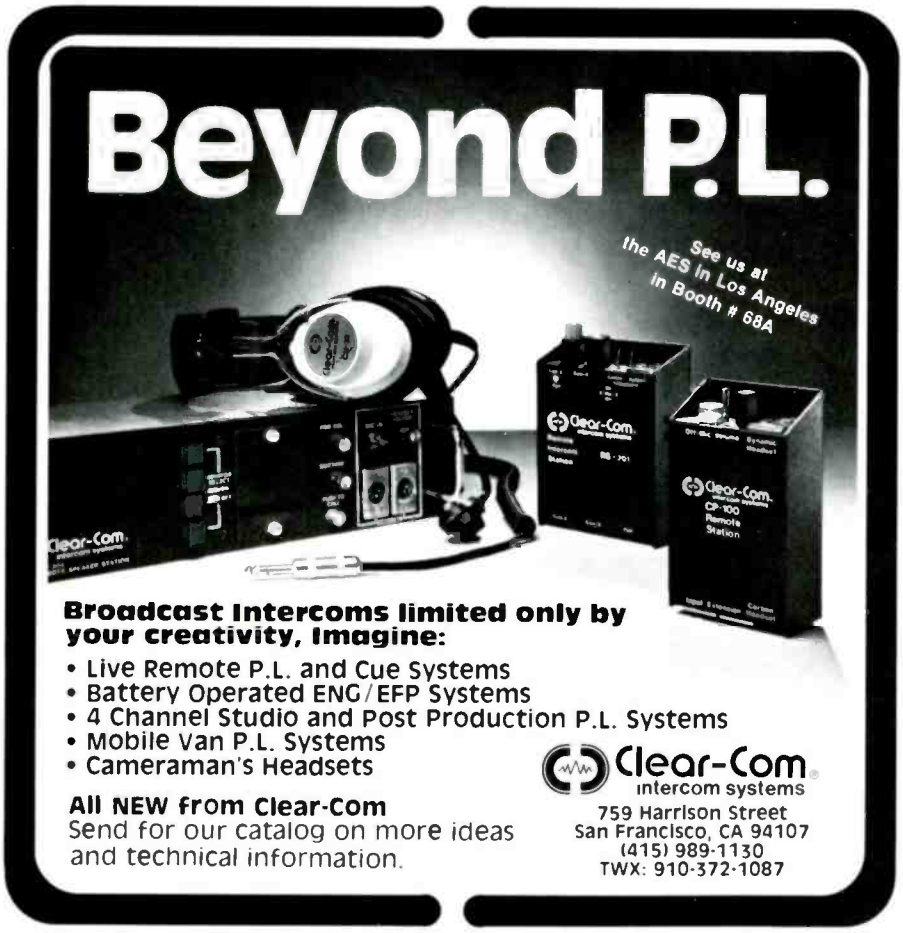
Error Detection: The superiority of Mitsubishi's error-detecting and error-correcting code adopted in the X-800 has been very clearly demonstrated in the two-channel X-80 mastering machine. In the X-800 it is even more dramatically effective: any eight of the 32 signal-carrying tracks could be affected by tape defects or dust and dirt before there would be any noticeable deterioration in audio quality in any channel. This apparent impossibility is achieved by the use of extra, error-correcting information recorded on additional tracks — two for every eight signal-carrying tracks — giving an average of 1.25 tracks per channel. Unlike competitive equipment, which generally has only one track per channel and an error-correcting code that is recorded separately along each track, the X-800 has an error-detecting (cyclic redundancy) code interleaved with the signal along each track, *plus* a powerful error-correcting (Reed-Solomon) code recorded across the width of the tape. Such a combination is said to make the X-800 almost impervious to the effect of even serious drop-outs.

The X-800's tape-transport system is a heavy-duty, ultrahigh precision unit operated by soft-touch switches. Every motor is under accurate control to provide optimum tape tension at all times. As a result, tape is never subjected to unnecessary strains. Also there is no need for pinch rollers in the system; tape is said to remain in ideal contact with the carefully contoured head assemblies, and tape loading is greatly simplified.

The 44 heads (40 for the PCM tracks, two analog and an auxiliary digital) built into the head assembly are of ferrite construction. This yields the advantages of ultrasmooth, mirror-finish surfaces, resulting in smooth tape handling and reduced wear. An in-line configuration makes the heads easier to align than staggered heads. This, with the powerful error-correcting capability, is more than adequate to ensure that recordings made on different X-800s are fully compatible with one another. (The one track per channel configuration adopted by some competitive equipment is said to impose such strict requirements on head alignment that no two tape recorders can be expected to satisfy them in exactly the same way, thereby making recordings done on different machines incompatible.)

The two analog audio channels are useful in giving an audible signal at non-synchronous speeds (the PCM channels can only be heard when the tape drive has been locked at rated speed under PLL-servo control). They can therefore be used to locate specific events along the tape. Provision has also been made for adding optional input and output amplifiers to exploit the remaining spare tape track. For instance, it could be used to record all the mixing data. Tying the mixing data to the original recording avoids the necessity for a separate storage medium for this data.

A full-function, detachable auto-locator control panel features positive-action pressure switches mounted beneath a protective membrane, to give instant control over an individual channel, a group of channels, or all channels at once. Memories are provided that enable the operator to store and recall four, 32-channel recording or monitoring setups, and the corresponding quiescent states (i.e., in both the "play" and



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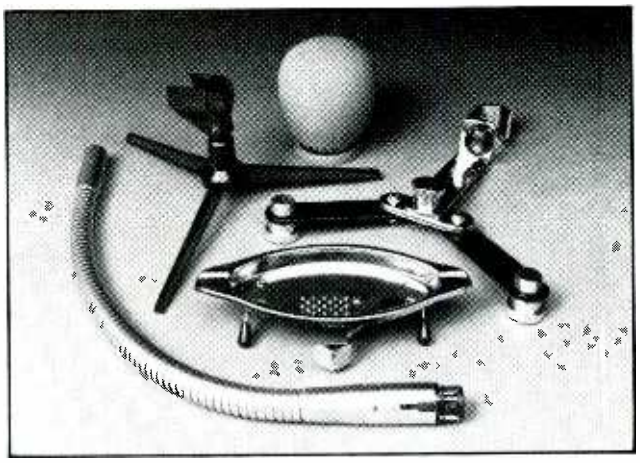

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"not-play" modes). The not-play mode corresponds with normal analog practice, where the studio output can be monitored as soon as the play mode is left, without plugging or unplugging the mixing console leads. Up to 100 separate takes can be stored for immediate recall.

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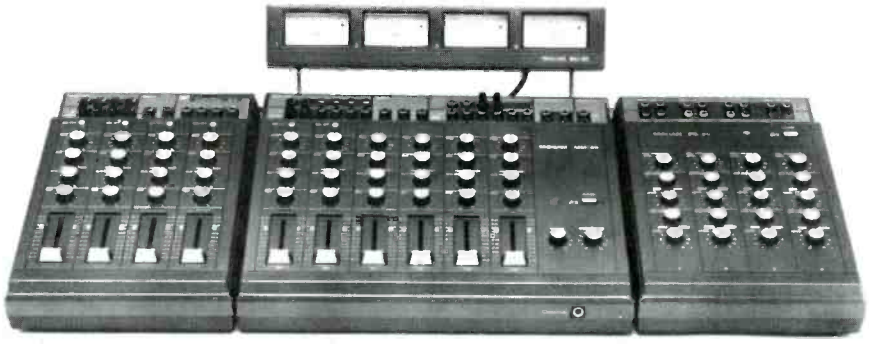

TEAC INTRODUCES NEW TASCAM MIXER CONCEPT

"The uniqueness of the new System 20 modular mixing system is in its absence of switches and, as a result, remarkable flexibility," according to Dave Oren, marketing manager of Tascam Production Products.

The System 20 operates much like an electronic patch-bay, in that the operator has access to all signals at all relevant points along the signal path.

"Originally, our intention was to design a mixing system for the artist/engineer who works alone," Oren commented, "but in the development process we soon realized that the System 20 is applicable to many multi-channel uses, because of its patching flexibility."

The basic unit in the system is the MM-20 Master Module, which offers six inputs (two transformer-isolated microphone inputs), six output busses (stereo line, monitor and cue), and provisions for four-track monitoring.

The PE-20 add-on unit consists of four channels of parametric-type equalization. The low frequency range contains a continuously-variable sweep-type setting from 60 Hz to 1.5 kHz, with up to 12 dB of cut and boost; the mid-range sweep control is fixed at 10kHz.

Additional transformer isolated inputs are available in groups of four with the EX-20 extender module. The MU-20 meter unit completes the system.

Suggested list prices for the System 20 are: $395 (MM-20); $350 (PE-20); $350 (EX-20); and $150 (MU-20).

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JBL'S MODEL 4430, 4435 MONITORS; MODEL 2225H/J AND 2235H SPEAKERS

Developed to meet the performance requirements of the latest digital and analog technologies, the 4430 and 4435 are said to represent a major engineering breakthrough in two-way monitor design. Each system incorporates a unique JBL bi-radial horn; both offer a variety of high-performance characteristics, including constant vertical and horizontal coverage, image stability, and flat power response.

The 2225H/J and 2235H 15-inch drivers feature JBL's unique Symmetrical Field Geometry (SFG) flux-stabilized magnetic structure, new high temperature adhesives and optimized coil former construction, resulting in increased power capacity with minimum distortion. The 2225H/J is designed for both horn loaded and vented box enclosures, and is ideal for high-power sound reinforcement systems; the 2235H is intended for custom studio monitors, or other applications requiring optimum bass efficiency and smooth response.

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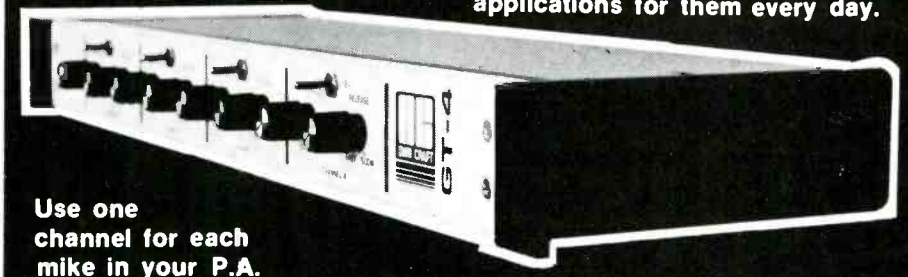

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independent release timer; or, perhaps, even a ducking de-esser.

Recording studios, broadcasters, and other Sound Industry professionals should find that Dyna-Mite is convenient to interface and use, as it plugs in instantly with ring/tip/sleeve jacks to -10 or +4 dBm lines, and is capable of driving 600-ohm loads. An optical battery pack allows an engineer to take Dyna-Mite wherever he goes.

A mono Dyna-Mite (convertible to stereo) lists for $295.00; and a stereo Dyna-Mite for $495.00.

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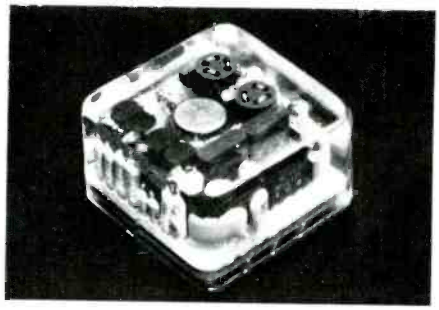
UPGRADED VERSION OF 990 OP-AMP FROM HARDY COMPANY

Although the circuitry and specifications remain the same, the 990 has gone through several changes in packaging and production as part of a continuing program of product improvement. The original component layout has now been revised, streamlining assembly, simplifying and reducing component handling, while retaining critical thermal proximities.



Testing has been expanded to include a total of 48 hours of active burn-in at 100°C/212°F, with 24 hours early in the manufacturing cycle and 24 hours just prior to shipment. In addition, output transistors are specially screened by their manufacturer (National Semiconductor), with electrical testing of all devices at 125°C/257°F.

Specification highlights include: equivalent input noise of -133.7 dBv (Re: 0.775V, shorted input, 20 kHz bandwidth); maximum output level of +24 dBv with 75-ohm load resistor; and slew rate of 18 V per microsecond with 150-ohm termination (16 V per microsecond into 75-ohm).

The 990 directly repalces API 2520 modules, has a one-year warranty for materials and workmanship, and is claimed to just plain sound better!

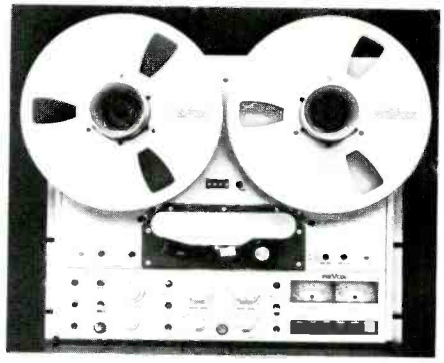
THE HARDY COMPANY
P.O. BOX AA631
EVANSTON, IL 60204
(312) 864-8060

For additional information circle # 117

REVOX INTRODUCES PR99 PROFESSIONAL TAPE MACHINE

According to Barry Evans, national sales manager of the ReVox Division of Studer ReVox America, Inc., introduction of the new Model PR99 deck marks the entry of Studer-made, ReVox-brand audio products into the professional segment of the audio marketplace.

Consistent with Studer standards, the ReVox PR99 uses a heavy, die-cast chassis for rigid stability, and utilizes Studer *Revodur* heads, plus a pneumatically-damped tension arm for excellent start-up characteristics. Balanced line (XLR) in/out facilities are standard.



Professional editing facilities include a fully-retractable headshield for easy marking access, and a tape-dump switch. Self-sync for both channels with automatic input switching when punching into record, and headphone monitor amplifier are standard features, as are ASU-VU meters supplemented by peak-reading LEDs. Full remote control, with vari-speed, is available as an option.

Standard 10½ inch reels are handled easily by high-torque reeling motors, and the direct-drive capstan motor is servo-controlled. Either 7½/15 or 3¾/7½ IPS speeds may be selected. The standard

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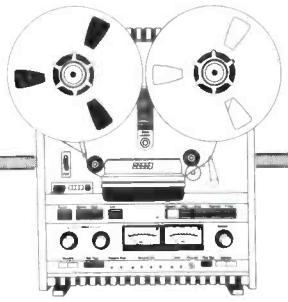
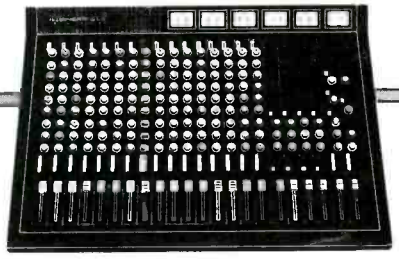


ALLEN+HEATH



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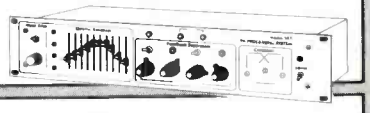
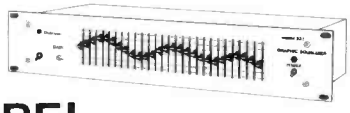
GAUSS

MICMIX





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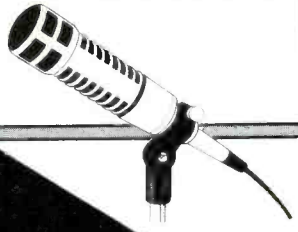

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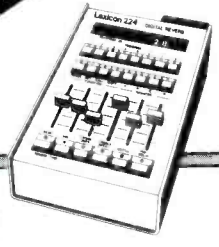
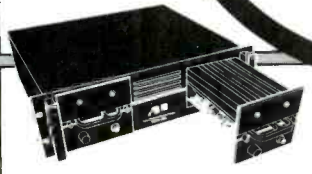
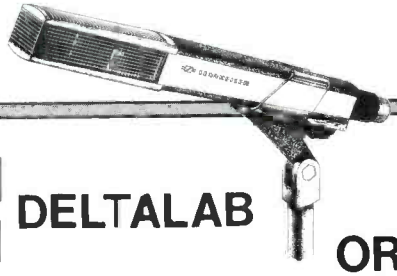
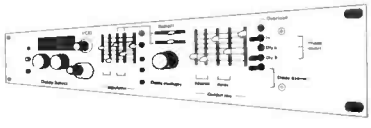




AB SYSTEMS

SENNHEISER





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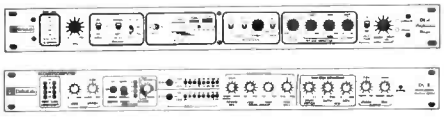

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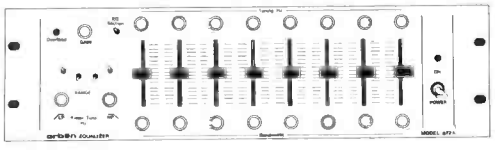

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configurations utilize 2-track or full-track heads and provide for unbalanced microphone inputs. Balanced mike inputs may be ordered as an option, and other configurations will be available shortly.

Frequency response of the PR99 is rated at 30 Hz to 20 kHz, +2 to -3 dB at 7½ IPS, with a 66 dB signal to noise ratio and a fluxivity of 500 nWb/m (less than 1.5% distortion). Wow and flutter, using the DIN peak-weighted measurement standard, is 0.08% at 7½ IPS.

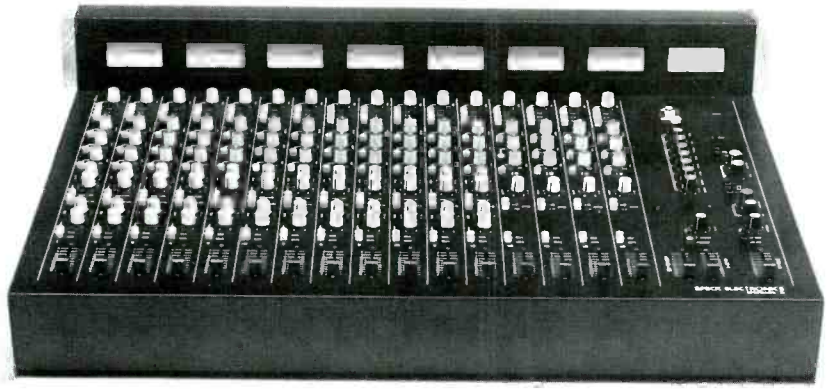
Adjustable from -20 dB to +9 dB at OVU. To match tapes with different sensitivities to a chosen line level, the output section has been provided with a calibrated/uncalibrated switch coupled with an output gain control. An additional calibrated/uncalibrated switch with input level controls is said to make the machine easy to interface to a wide range of input levels. Professional user net price is $2,095.

STUDER REVOX AMERICA, INC.
1425 ELM HILL PIKE
NASHVILLE, TN 37210
(615) 254-5651

For additional information circle # 119

NEW LOW-COST 16/8 CONSOLE FROM SPECK

The SPECKMIX 16 is a 16-input, 8-output recording console, intended specifically for professional and semi-professional 8-track studios. Features include: 16 complete input channels; eight mixing bus outputs; eight large VU meters; 8-track pannable assign; 6frequency, 3-band equalizers; low-noise transformerless mike inputs; control room



and studio playback; talkback and cue prompts; independent stereo mixdown bus; +4 dBm operating levels; stylish European color-coded knobs; and solid oak sides.

Frequency response is a quoted 23 Hz to 20 kHz (±1 dB), output level +4 dBm, maximum output level +22 dBv, noise -72 dB (mike input to bus output) and -80 dB signal-to-noise ratio (line input to program feed output).

Suggested list price of the SPECKMIX 16 is $2,975.00.

SPECK ELECTRONICS
7400 GREENBUSH AVENUE
NORTH HOLLYWOOD, CA 91605
(213) 764-1200

For additional information circle # 120

please mention . . .
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AUDI-ENCE PPS-1000™ PHANTOM POWER SUPPLY

Designed for console/mixer applications, retrofit 1% precision resistor kits are also available for converting those units not presently configured for this option to phantom powering.

The heavy duty unit is said to be capable of powering up to 80 microphones of typical design (.5 ampere load). It is fully regulated, filtered and protected with screw on type binding posts for easy hookup.

Available from pro audio dealers, the unit carries a list price of $185.00 with deliveries ranging from stock to three weeks.

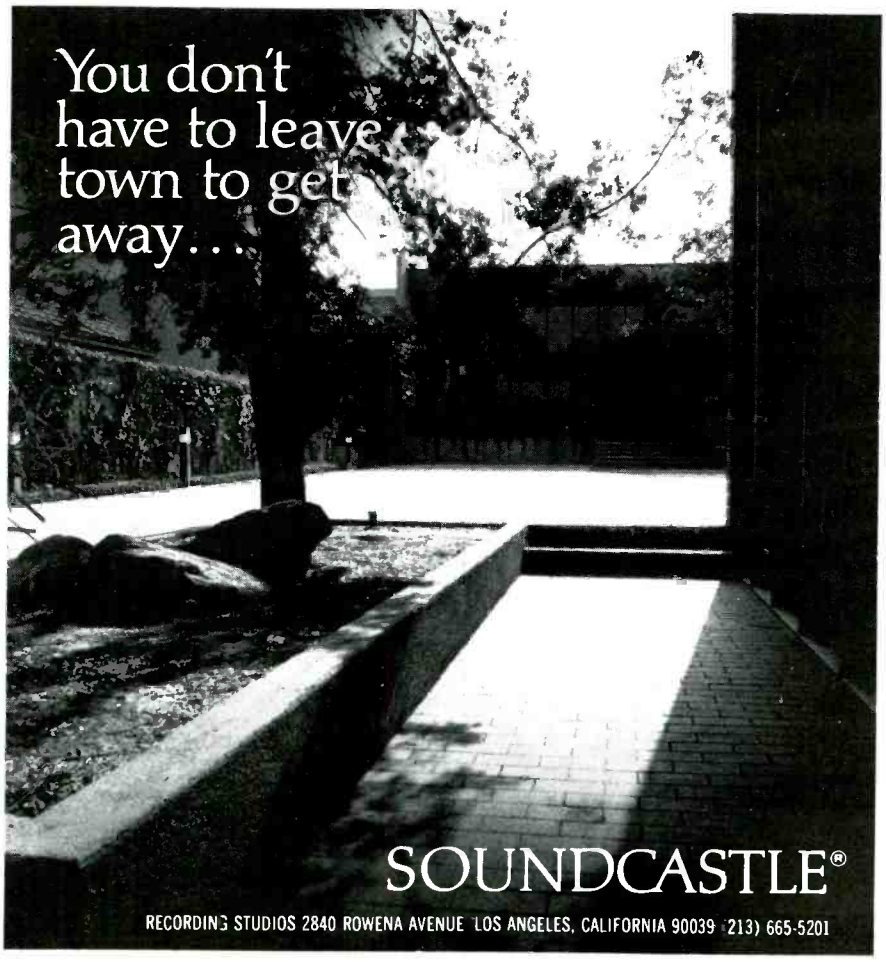
AUDI-ENCE, INC.
3325 VISTA OAKS
GARLAND, TX 75043
(214) 226-2189

For additional information circle # 122

URSA MAJOR ANNOUNCES 8X32 DIGITAL REVERB SYSTEM

The new unit produces a wide range of natural and artificial effects, suitable for studio, broadcast, live performance, and other applications where clean, high-quality sound is important. The microprocessor-based front panel has separate LED read-out and control for each adjustable reverberation parameter. These displays and controls are said to make the 8X32 an exceptionally "friendly" system to operate, despite its sophistication.

The 8X32 also feaures a bank of 32 nonvolatile storage registers that retain their contents even when the power is turned off. These allow users to store and recall 32 complete reverb set-ups, and to edit them at will. Four basic programs are available with the 8X32, ranging from a small, fast-diffusing "Plate", to a large, echoing "Space" simulation. Within each of these programs, 16 decay times can be selected (0.2 to 19.9 seconds, depending on program), and the level (8 steps) and delay time (approximately 6 to 9 milliseconds in 16 steps) of both the



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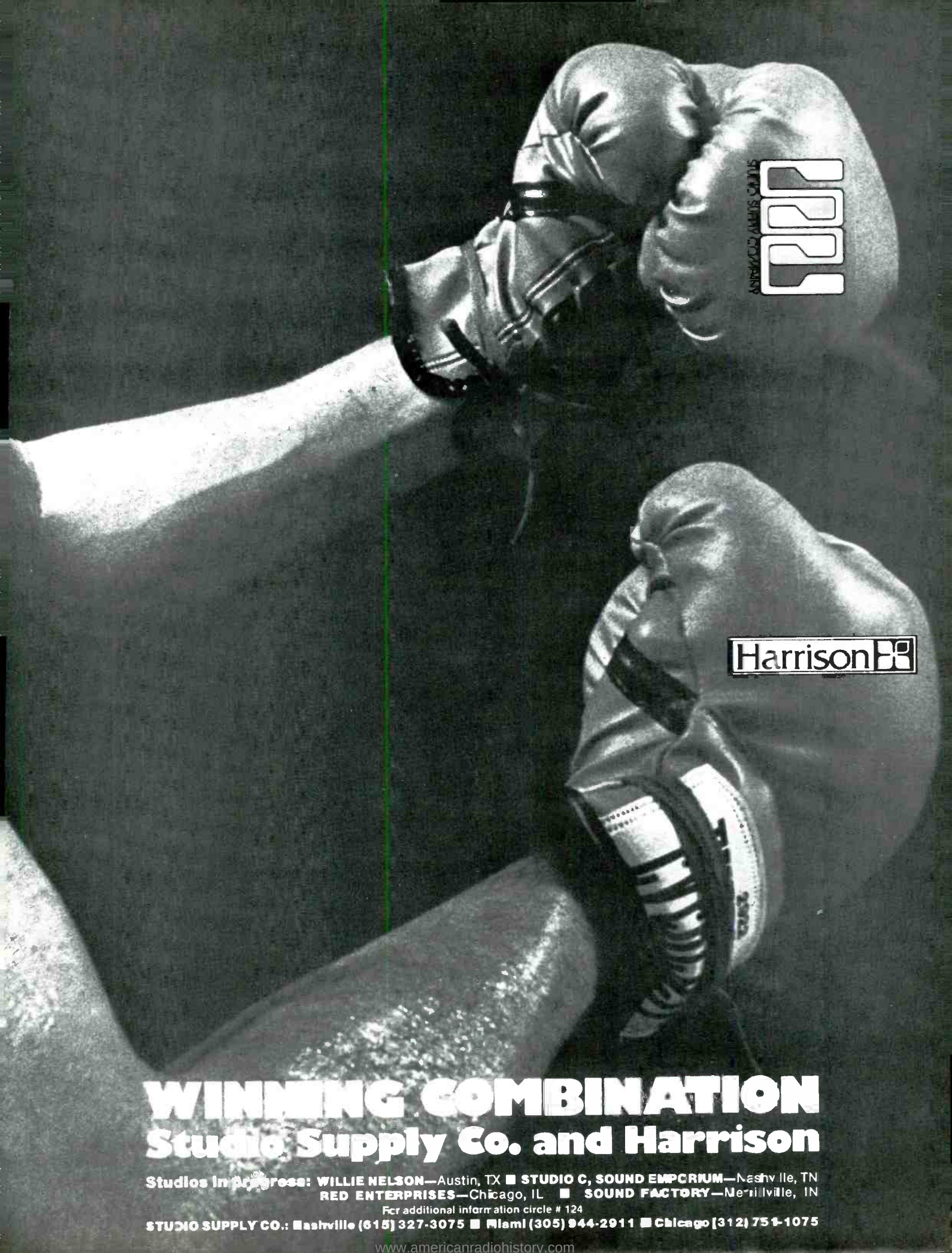

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For additional information circle # 124

STUDIO SUPPLY CO.: Nashville (615) 327-3075 ■ Miami (305) 944-2911 ■ Chicago (312) 751-1075

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early reflection pattern and the initial reverberation may be independently controlled. Low- and high-frequency decay can also be individually trimmed (4 values each).

Two unique controls, "Input Mute" and "Reverb Clear", are said to provide especially useful effects for performing artists. The system has a bandwidth of 8 kHz and a dynamic range of 80 dB.

The 8X32 is a compact, rack-mountable unit measuring 3½ inches high, 19 inches wide, and 10 inches deep. Controls and displays are available at time of purchase on the front panel, in a remote unit suitable for use on consoles, or both.

URSA MAJOR, INC
P.O. BOX 18
BELMONT, MA 02178
(617) 489-0303

For additional information circle # 123

STEPHENS REDESIGNED PORTABLE EIGHT-TRACK RECORDER

Improvements announced by the company include more compact packaging, an updated servo system, and a frequency response within 1 dB from 30 Hz to 25 kHz at 30 IPS. New features are a built-in 60-Hz resolver for video or film synchronizing, and the capability of operation from a 24-volt battery in the field.

Along with Stephens other multi-track recorders, the 811D-103A portable 8-track is

completely transformerless, and runs without the use of capstans and pinch rollers. The machine is supplied with the transport controls as a remote unit, and runs at 15, 30 or 60 IPS, with 10-80 IPS varispeed.

Each channel can be assigned to automatically mute, switch to source, and record. Record and playback headroom is rated at over 40 dB at 1 kHz to accommodate heavy overloads.

The portable 8-track can be supplied in two deck sizes. The 103A deck accepts reels up to 10½-inches, and 104A up to 14-inches. Mounted in two rugged cases, the complete unit weighs only 80 pounds. Suggested retail price: 811D-103A is $17,580; 811D-104A is $17,830.

STEPHENS ELECTRONICS, INC.
3513 PACIFIC AVENUE
BURBANK, CA 91505
(213) 842-5116

For additional information circle # 126

NEW TELEX WIRELESS DIVERSITY MICROPHONE SYSTEM

The Telex FMR-1 operates as a conventional FM wireless microphone receiver when only one antenna is installed, and automatically operates as a dual diversity receiver when two antennas are used. The combined signal of the two antennas is automatically phase shifted by the receiver for the best signal-to-noise ratio. The system is said to be so effective against switching noise and the common problem of "dropout" or "picket fencing", that Telex has applied for a patent on the unique diversity circuitry.

A belt-pack transmitter, WT-100, is battery powered. Roughly the size of a package of cigarettes, the transmitter is easily concealed under clothing. A standard LEMO connector accepts an extremely small Telex WLM-100 electret lavalier microphone. A 4-foot adapter cable is provided with each belt-pack transmitter for instant adaptation of any low-impedance microphone fitted with a male XLR type connector.

Both the receiver and transmitter are FCC-type accepted under Parts 90 and 74, and incorporates unique circuitry that logarithmically compresses the dynamic range of the audio signal for transmission, and expands it correspondingly upon reception. The apparent signal-to-noise-ratio is likewise compressed and expanded, thus improving this factor by 20-25 dB over other systems.

The Telex WHM-300 handheld transmitter microphone is lightweight and exremely slim; there are not unsightly antenna protrusions or trailing wires. Both a ball screen and slotted-head screen are supplied with each unit, to instantly change the

Don't Drag 8 Audio Cables, Multiplex on one (1) Mic Cable with Edcor's New Multiplex Snake!

Now you don't have to hassle with dragging 8 microphone cables. You can put one down or pick one existing cable and Multiplex 8 audio channels cost effectively up to 1500 feet. Quality of the audio emerges better than equal runs of conventional analog signal transmission. Write **Edcor** at 16782 Hale Avenue, Irvine, Ca. 92714 or call (714) 556-2740. *Suggested list price from $365.*

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The Telex 300 duplicating system. Versatile, expandable, dependable.

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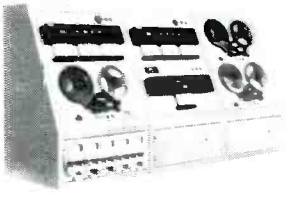

A Building Block System: A modest capital investment gets you started whether in cassette-to-cassette, reel-to-cassette, reel-to-reel, in two or four channels. Start with a basic unit and later add modules to suit your growing requirement.

Modular Electronics: Individual plug-in modular electronics permit fast easy service and minimum downtime. Since the system is made in the U.S.A., parts and service are readily available, through a coast-to-coast dealer network.

Now Long Life Heads at No Extra Cost: Cassette slaves with new long life heads last 10 times longer than conventional heads, reducing downtime and replacement cost.

Telex also has available desk top cassette copiers.

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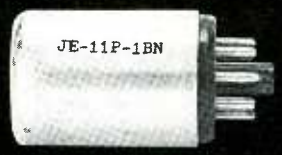

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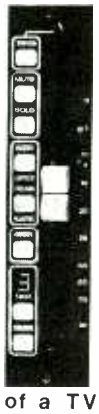
THE ALTERNATIVE

If you're considering buying a new console just to get sophisticated automation, there is an alternative.

THE FAX SERIES 1 PROGRAMMABLE FADER SYSTEM, designed from a recording engineer's point of view, offers a level of functional flexibility far beyond the scope of contemporay automated faders. Simple to use, it is the first automated fader to employ recessed membrane switches, and to visually indicate both current and previous fader position simultaneously on the front panel, allowing the operator to consentrate on the mix instead of a TV screen. This visually striking module with its exceptionally durable, wear-resistant panel, will revitalize your console's apperance and performance for years to come.



Systems start at $11,500.00

Our complete line of components, featuring the unsurpassed FA-100 OP-AMP, will sonicly improve API and other fine consoles.

FAX AUDIO, INC
NEW YORK (516) 261-6085

For additional information circle # 129

New Products

appearance when desired. A power on/off switch conserves battery power when not in use, and prevents RF carrier system noise. A separate audio on/off switch is also provided.

The Telex wireless microphone system operates in the 150-174 MHz range and is crystal-controlled, single-frequency. Two standard frequency groups are available as catalog items while a special frequency, in the 150-165 MHz band, may be custom ordered.

TELEX COMMUNICATIONS, INC.
9600 ALDRICH AVENUE SOUTH
MINNEAPOLIS, MN 55420
(612) 884-4051

For additional information circle # 130

NEW DUAL-IMPEDANCE DYNAMIC CARDIOID MICROPHONE FROM ELECTRO-VOICE

"The 681 is a perfect hand-held microphone for those who need a high-performance mike with dual-impedance capability," according to Bob Morrill, Electro-Voice's vice president of marketing and sales. "This capability makes the 681 equally at home in both sound reinforcement, churches or auditoriums."

"Frequency response of the 681 has been tailored to complement the human voice," Morrill continued. "It has contoured bass boost to add presence to vocals when used up close, and a slightly elevated high end keeps vocals from sounding muddy. The 681 was primarily designed as a vocal microphone, and is at home in any environment where vocal intelligibility is a prime concern."

The 681 has a suggested net price of $130.00, and comes complete with a 15-foot cable and stand clamp.

ELECTRO-VOICE, INC.
600 CECIL STREET
BUCHANAN, MI 49107
(616) 695-6831

For additional information circle # 131

dbx INTRODUCES TWO-CHANNEL SIMULTANEOUS ENCODE/DECODE NOISE REDUCTION SYSTEM

Suitable for small studio applications, the dbx Model 150 is 1¾-inch high, rack-mounted, and has been optimized for use with tape transports running at 15 or 30 IPS.

Designed to bring professional noise reduction to the small studio at an affordable price, the dbx 150 is equipped with gold-plated phono jack input and output connections, and stacks easily for use with different multi-track formats. Because it is a simultaneous encode/decode unit, the Model 150 eliminates the disadvantages of relay or manual switching between record and play operation, thereby providing decoded tape monitoring without sacrificing the ability to do punch-ins.

The dbx 150 is compatible with all other dbx Type 1 Tape Noise Reduction Systems, ensuring compatibility with dbx systems used in major studios throughout the world.

dbx, INCORPORATED
71 CHAPEL STREET
NEWTON, MA 02195
(617) 964-3210

For additional information circle # 132

NEW SONY PORTABLE STEREO MIXER

Called the Model MX-P42, the unit is an ultra-compact, fully-equipped portable mixer that combines up to four separate audio sources to stereo outputs and features onboard compression/expansion.

Additionally, the MX-P42 is said to afford premium sound quality, panning for precise stereo imaging, and automatic level control for optimum mixing of any sound sources. Features include solo functions on all four inputs, as well as low cut filters selectable at either 80 or 160 Hz, and 11 kHz high-cut filters. All filters provide attenuation of 18 dB per octave.

The ALC has a variable expander threshold level of -40 dB to -10 dB, with attack time of less than 5 microseconds, and a recovery time of 0.1 second. With a fixed threshold level, the compressor has an attack time of less than 5 microseconds, and

a recovery time of either 0.5 seconds or 0.1 seconds. The enhanced dynamic range capabilities of the MX-P42 assure quality audio with protection against unforeseen level changes in field applications.

The MX-P42 has a quoted frequency response of within 0.5 dBm from 30 Hz to 20kHz, and a harmonic distortion rated at less than 0.1% at +4 dBm. With four channel inputs, microphone sensitivity is switchable to -70, -60, -50, or -40 dBm, and line input is

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The Omega School of Applied Recording Arts and Sciences announces an intensive workshop/seminar for the summer semester, beginning on June 19, 1981.

This special session has been designed to instruct amateur, student and semi-professional recording enthusiasts in the fine art of making better tapes.

Beginners will be thoroughly trained in the logic, theory and economics of professional recording.

Super Session '81 will feature lectures and workshops by internationally acclaimed professionals, including Joseph Tarsia, president of Sigma Sound, Philadelphia and New York; Larry Ecden, digital mastering engineer for JVC Digital in Los Angeles; John Woram, editor of db magazine and author of "The Recording Studio Handbook"; Jay Chattaway, independent producer under contract to CBS records; as well as other leading experts who will make sure you "mix with the pros".

The Basic and Intermediate 10-day Intensive Course covers Electronics, Studio Management, Record Production, Acoustics, Sound Reinforcement, P.A., Concert Recording, Demo Production, Studio Effects and Multi-Track Theory.

Advanced seminars and workshops will cover Radio Production, Automated Mixing, Music Production, Jingle Production and Studio Maintenance. Qualifying basic and advanced students will get hands-on experience in Washington's newest and most sophisticated 24-track automated studios.

Basic and Intermediate Tuition is $895 (including all lab fees, books, supplies and certain meals). Advanced tuition is $1095 (inclusive). Advanced workshops are limited and early registration is advised. Register before May 22nd, and receive a free copy of John Woram's "Recording Studio Handbook," a $37.50 value.

Both packages offer accommodations for the 9 nights and ground transportation to and from those accommodations for only $100 additional. Early enrollment is required if you desire accommodations.

If you suspect that your career lies in the field of music, studio recording or media production, Super Session '81 will provide you with an excellent opportunity to avoid a lot of mistakes that have already been made by the pros.

And the pros will be at Super Session '81.

For enrollment information, clip the coupon or call (301) 946-4686 or (301) 946-3242 weekdays. Master Card and Visa are acceptable forms of payment. The Omega School of Applied Recording Arts and Sciences.

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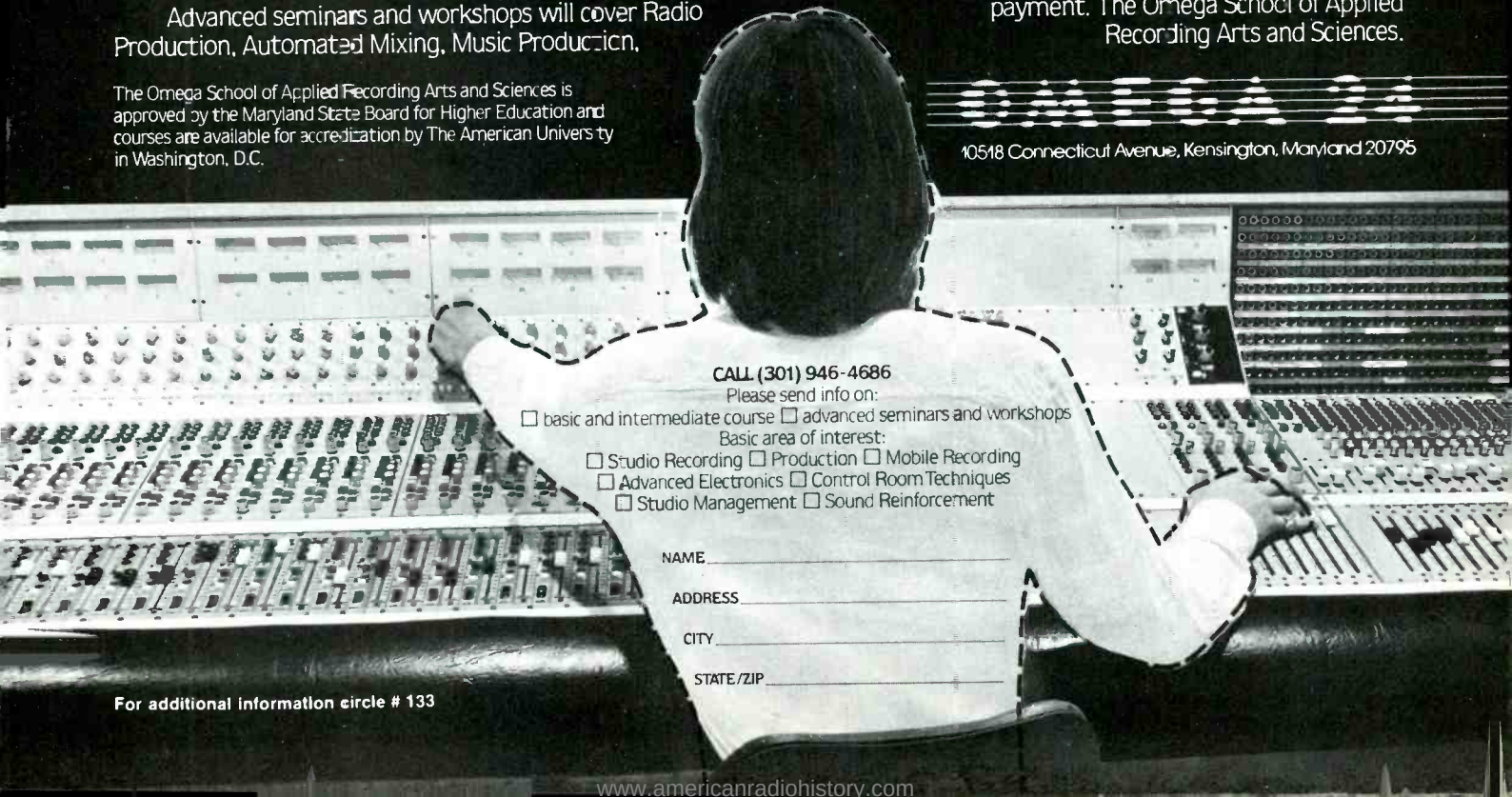
10518 Connecticut Avenue, Kensington, Maryland 20795



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For additional information circle # 134

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For information and applications, write: Summer Sessions, Dept. L, Eastman School of Music, 26 Gibbs St., Rochester, N.Y. 14604.

The Eastman School provides equal opportunity in admissions and student aid.

For additional information circle # 135

New Products

switchable to either -20 or +4 dBm.

The mixer has two pairs of stereo outputs. The first pair provides a line level of +4 dBm into 600-ohm circuits with 16 dB of circuit.

The MX-P42 measures approximately 10½ inches x 8 inches x 3 inches, and weighs only 7.7 pounds complete with three C-cell batteries.

SONY PROFESSIONAL AUDIO DIV.
9 WEST 57TH STREET
NEW YORK, NY 10019
(212) 371-5800

For additional information circle # 136

XM SERIES MIXING CONSOLES FROM NEPTUNE

The XM Series is said to offer new dimensions in control over live and recorded sound, with four submaster/stereo/mono output formats, available in 8, 12, 16, and 24 input channel versions, plus excellent specifications. To further enhance control and flexibility, NEI engineers designed the XM's circuitry to provide the optimum in sonic performance, while packaging it all in an attractively styled chassis with built-in wrist pad and wood sides, capable of standing up under the rigors of the road and mobile use.

Models 84XM, 124XM, and 244XM include a host of features: transformer balanced microphone input with switchable line level input; input preamp input/output jacks; pre EQ/fader monitor bus; post EQ/fader effects bus; switchable pre- or post-aux bus; and extensive input preamp equalization with switchable bass shelving (80 or 200 Hz) and sweepable midrange.

Also: submaster assignment switches; channel mute (post fader, except solo); solo; 60-mm slide channel fader; submaster controls; independent left and right, mono output level controls; monitor master with solo; selectable LED output metering; submasters 1 to 4 or left, right, monitor and mono; effects and aux-send masters (with solo) and returns with effects and aux return pan controls; and solo bus level control with solo status LED.

In addition the products contain: powerful headphone amplifier with level control; submaster output and input jacks; balanced and unbalanced left, right, monitor, and mono outputs with function input jacks; high- and low-level effect/aux send and return jacks for use with mic or line level effects devices; plus external power supply jack and internal/external power supply selector switch.

NEPTUNE ELECTRONICS, INC.
934 N. E. 25TH AVENUE
PORTLAND, OR 97232
(503) 232-4445

For additional information circle # 137

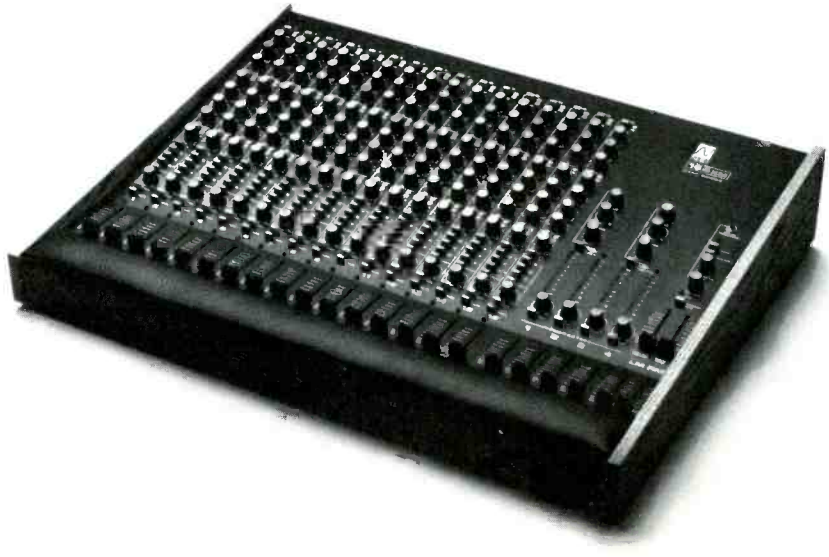
SHURE INTRODUCES NEW SM85 HIGH-QUALITY CONDENSER MICROPHONE

The Model SM85 is a professional-quality, hand-held, unidirectional condenser microphone designed for the most demanding applications in sound reinforcement, broadcasting and studio recording. It is especially suitable for applications

requiring wide frequency response, low distortion characteristics, very low RF susceptibility, and reliable operation over a wide range of temperature and humidity extremes.

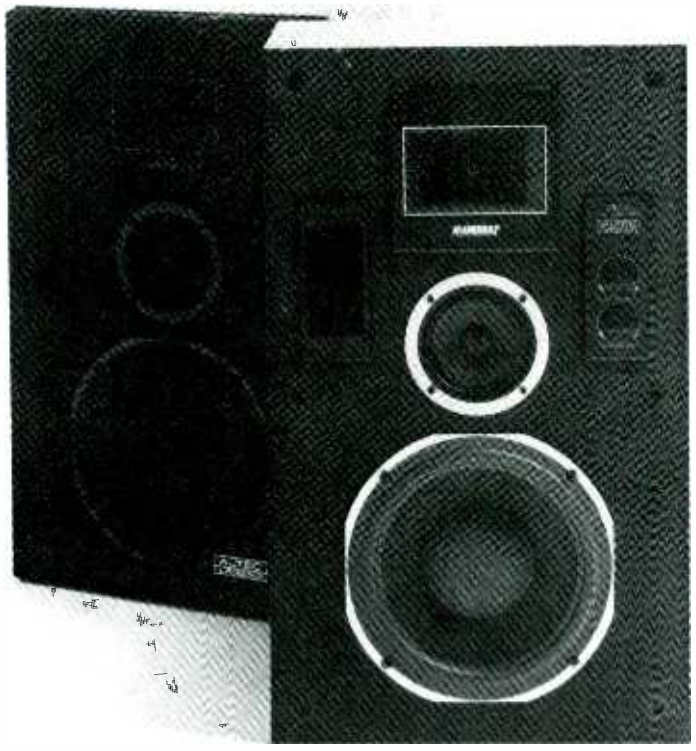
The SM85 makes optimum use of proximity effect to give the performer control of low-frequency sound, from the warm intimacy of close miking to the natural sounds of normal-to-distant miking.

It also features an integral wind and pop filter, a high-frequency presence peak, a controlled low-frequency rolloff, and an effective shock mount for reduced stand and



www.americanradiohistory.com

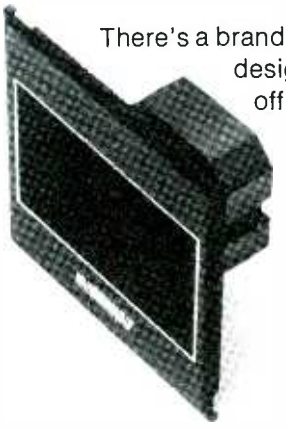
Announcing the new Altec Lansing 9813 high-accuracy recording monitor.



Loudspeaker accuracy. It's a highly controversial subject. And for good reason. The most prized result of a recording session is an accurate sonic illustration of what is going on in the heads of the producer, musicians, arrangers, and composers. Recording is a process of fusion, and the monitor is responsible for an accurate painting of the completed sonic picture.

Enter our new 9813. We developed it to play its highly critical part in the fusion process with great accuracy. We did it by putting nearly half a century of audio alchemy into it.

The 9813 has an all new high-frequency compression driver that uses our famous Tangerine® radial phase plug.



There's a brand new network design the patent office is already looking at, and the smooth, accurate highs are controlled by an asymmetrical Manta-ray® horn.

The 9813 handles power like no small monitor you've ever experienced. It takes on big amplifiers as though it were addicted to watts. And if you should push it to the limit, there's a built-in system we call automatic power control, which *lowers the power* (never shuts the speaker completely off) and lights a red indicator on the front panel at the same time.

The new 9813 does everything a great monitor should: It sounds super (accuracy need not be unpleasant), handles power extremely well, mids and highs adjust through very wide amplitude ranges, and its great-looking hand-rubbed oak cabinet is small enough for even mobile recording vans (25½ H x 15½ W x 13½ D).

Next time you're visiting your favorite pro audio dealer, ask to hear the new 9813. What you'll hear will be the honest truth.

ALTEC LANSING®

Altec Lansing International
1515 South Manchester, Anaheim
California 92803 (714) 774-2900

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For additional information circle # 138

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jensen transformers
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JE-11SSP-6M and JE-11SSP-8M
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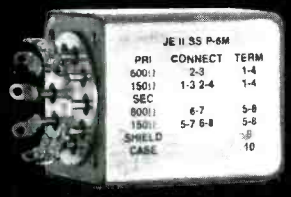
- Sturdy solder terminals
- 4 threaded inserts at each end for flexible mounting



Unsurpassed Audio Quality

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Maximum Level @ 20Hz	+18dBm	+23dBm
Distortion @ 20Hz, +4dBm	0.035%	0.02%
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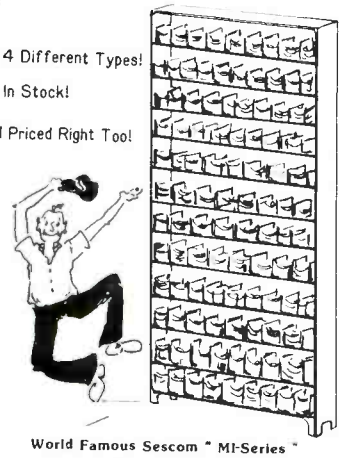

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For additional information circle # 141

New Products

handling noise. The case is constructed of aluminum for light weight and ruggedness, with a steel grille and durable black finish.

The SM85 is designed for simplex (phantom) powering from an external supply or directly from sound reinforcement, broadcast, or recording equipment. It operates over an extremely wide voltage range of 11 to 52 V D.C., covering both DIN Standard 45 596 simplex voltages of 12 and 48 volts, and the proposed 24-volt standard.

The microphone is supplied with an accessory foam windscreen and a swivel adapter. Model SM85 is supplied without a cable, whereas Model SM85-CN is supplied with a 25-foot Triple-Flex® microphone cable with professional audio connectors. Two dual-channel power supplies (Models PS1 and PS1E2) are available for providing simplex power to the SM85.

SHURE BROTHER, INC.
222 HARTREY AVENUE
EVANSTON, IL 60204
(312) 866-2200

For additional information circle # 139

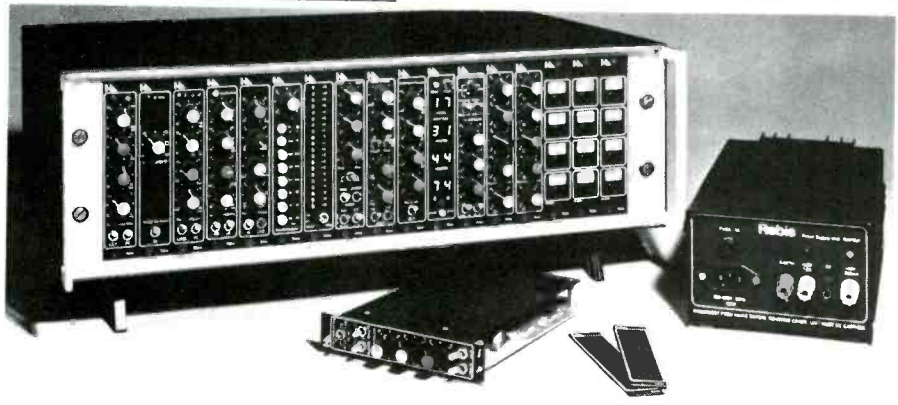
KLARK-TEKNIK APPOINTED DISTRIBUTORS FOR REBIS AUDIO

Rebis Audio, located in Stourbridge, England, manufactures a complete range of signal processing modules, including the RA201 Noise Gate, RA 202 De-Esser, RA 203 Comp-Limiter, RA204 Parametric EQ, RA212 Mic-Line Preamp, and RA210 R1AA Disk Preamp. The modules are for use with the RA200R 16-module rackframe, and either a free-standing or 19-inch rackmount power supply.

According to Jack Kelly, President of Klark-Teknik Electronics, Inc., modular signal processing is gaining popularity worldwide. Recording studios and P.A. companies are very conscious of rack space and the modular concept solves this problem. Kelly states that the Rebis product has already been well received in the U.S. because of the great variety of modules available, and the very affordable price.

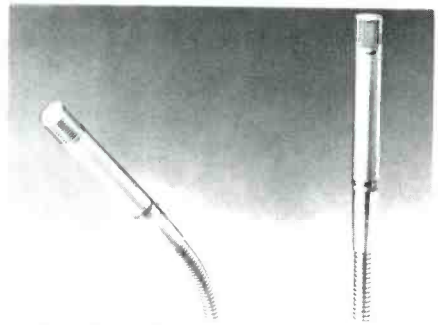
KLARK-TEKNIK ELECTRONICS, INC.
262 A EASTERN PARKWAY
FARMINGDALE, NY 11735
(516) 249-3660

For additional information circle # 142



SONY INTRODUCES C-35P AND C-36P CONDENSER MICROPHONES

Both units provide cardioid pattern directivity and feature slim, elegant design for unobstructed stage and studio applications. The microphones utilize a D.C.-biased condenser capsule to provide a frequency response of 30 Hz to 16 kHz. Signal to noise ratio is said to be better than 72 dB, dynamic range is greater than 116 dB, and maximum input level is 138 dB SPL when using the wind screen. Output level is -61 dB and output impedence is a low 100 ohms.



The Model C-35P is designed to receive sound from sources in direct line with the microphone, while the C-36P is sensitive to sound which is at a right angle to the microphone axis.

Phantom power requirement of the two models is 48 V.

SONY PROFESSIONAL AUDIO DIV.
9 WEST 57TH STREET
NEW YORK, NY 10019
(212) 371-5800

For additional information circle # 5

AUDIO KINETICS Q-LOCK 310 FOR THREE-TRANSPORT SYNCHRONIZATION

A highlight of the recent NAB Convention in Las Vegas was the demonstration of a 3M Digital Mastering System synchronized to an NEC one inch video recorder, using the Audio Kinetics Q-Lock 310 Synchronizer.

The Q-Lock 310 has all the features of the successful 210, plus the added ability to synchronize three audio or video recorders and instantly select a slave as a master for two-machine operation.

In addition to the 3M Digital Mastering System, optimized software has recently been developed for a wide range of audio and video machines, including the Studer A800, Telefunken M15A Otari MTR-90, JVC 6600

. . . continued overleaf —

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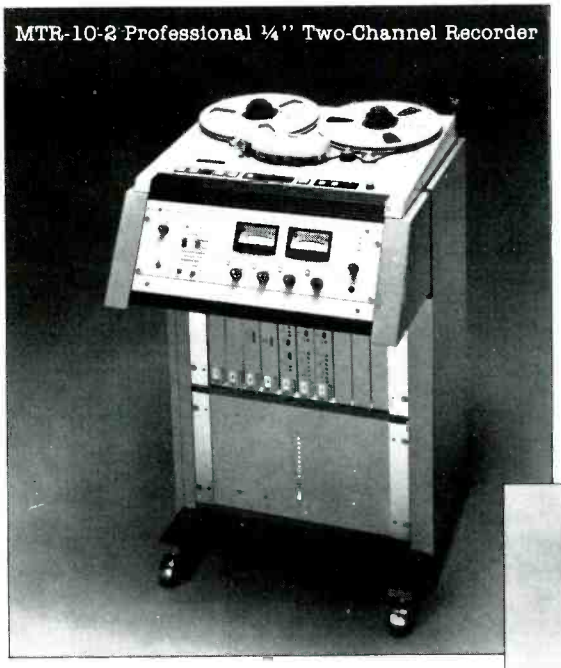
No one can be everything to everybody—not in the audio field or anywhere else. But if you're a serious professional in the recording business, and you're looking for the company that can meet all your needs for design, equipment, installation and service, Westbrook Audio can do everything for you.


MTR-10-2 Professional ¼" Two-Channel Recorder

In the Southwest, Westbrook Audio is the source for the finest names in audio, including the incredible Otari MTR Series recorders. Westbrook's dedicated sales and engineering staff will work with your to understand your special needs, and back up any sale with the finest service available. And you can road-test anything Westbrook sells in its own totally equipped 24-track audio/video facility.

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For additional information circle # 143

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For additional information circle # 144

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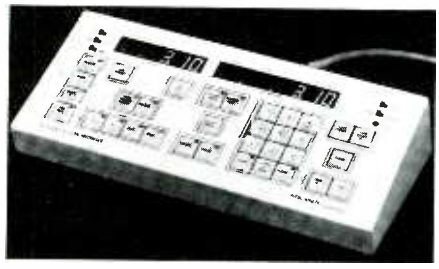
For additional information circle # 145

New Products

Series, Ampex ATR-124, and the IVC 9000.

All Q-Lock synchronizers are supplied complete with a multi-standard time code generator, and software-optimized machine interfaces to customer choice. Dissimilar machines may be synchronized with no limitation, excepting special requirements for use of video machines as slaves.

Q-Lock installation requires no special



wide-band amplifiers to be fitted to any audio machine, as tape is not against the heads in wind modes. However if a one or two inch video machine is utilized, high-speed time code is automatically presented. Q-Lock can be supplied with a high-speed-time code reader for this purpose, at no extra charge, if specified at the time of ordering.

AUDIO KINETICS (UK) LTD.
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QUINTEK DISTRIBUTION, INC.
4721 LAUREL CANYON BLVD, #209
NORTH HOLLYWOOD, CA 91607
(213) 980-5717

For additional information circle # 146

AUDY INSTRUMENTS MONITOR MIXING CONSOLE

The Series 2000M Monitor Mixing Console provides 16 inputs (stackable to 32), with separate output mixes that permit control of up to six independent monitor sends. Use of high-speed, low-noise IC op-amp technology is said to minimize transient and slewing induced intermodulation distortion. A dual LED system assures proper adjustments of input attenuation switches, and maintains 25 dB of headroom throughout for clean sound.

Standard features include Penny and Giles faders and sealed conductive plastic rotaries, for smooth and quiet control; input and output channel patching; EQ in/out switch for each input mix control; individual channel muting; talkback; six auxillary inputs; headphone monitoring with solo priority system; high resolution, 20-segment LED bargraph meters; phantom power; work lamp socket; and flight case.

The Audy Series 2000M Monitor Mixing Console is list priced at $6,995.

AUDY INSTRUMENT, INC.
SHETLAND INDUSTRIAL PARK
P.O. BOX 2054
SALEM, MA 01970
(617) 744-5320

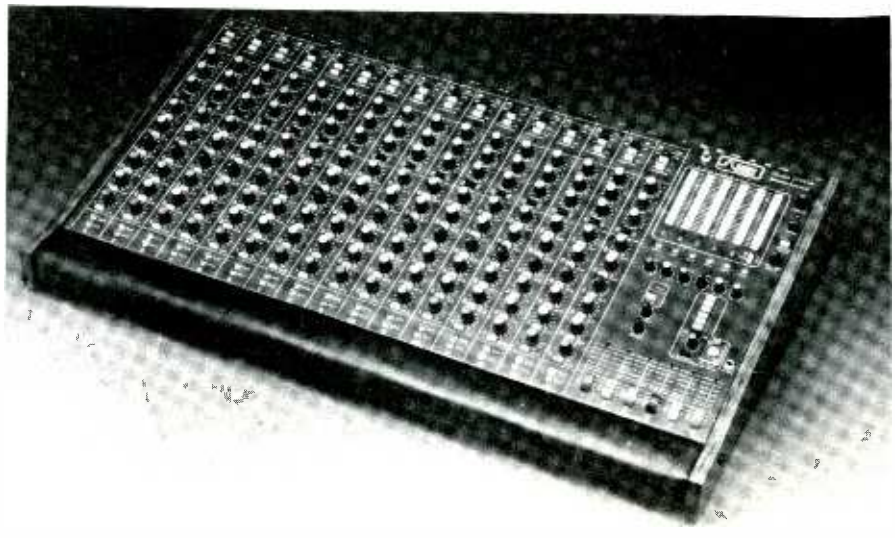
For additional information circle # 147

SPHERE INTRODUCES DIGITAL FADER

Described as the first practical digital fader and attenuation system for the recording industry, the new Sphere unit is said to eliminate two of the most bothersome components in any mixing console. Namely, the VCA, and the mechanical fader, which has always been prone to noise and wear and tear — not to mention problems associated with coffee and Coke spills.

The new Sphere system features no moving parts at all. Level changes are accomplished by placing a finger in a shallow trough, in which was formerly located the fader knob. According to David Holmes, Sphere's sales manager, it makes no difference where in the trough your finger is placed — that is, there is no need to worry about it coming in contact with a knob. All that matters is moving your finger in the right direction — up and down — because the digital fader does the rest. An LED cursor provides visual indication on a scale of -80 to +15dB.

The fader package will include two programmable pre-set level switches, and a mute. As an option, each fader can be equipped with a numerical readout, calibrated in decibels, mounted directly



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The most respected audiophile-quality power amplifier line in the world was available first to professionals! Bryston amplifiers bring with them years of hands-on experience in sound-studios, where they have proven their unique accuracy; on the road, where they have proven absolutely unmatched reliability; in hundreds of professional installations all over the world, where they continue to prove every day that for uses requiring flawless sonic quality, tremendous load-driving ability and zero down-time, Bryston has no equal.

Bryston discovered early the advantages of high-stress life-testing in ensuring long term in-use reliability. Every Bryston amplifier undergoes 100 hours of full dissipation burn-in using a square-wave input signal and a capacitive load. Before we ship it, we prove its reliability.

Bryston's extremely linear circuitry, controlled-feedback design, twin power-supplies and low-level voltage regulation provide across-the-spectrum musical accu-

racy which has been recognized by studio engineers and audiophiles alike as the best in the world.

Discover the advantages of the Bryston philosophy for sonic perfection and on-the-road reliability. Meet us at the Los Angeles Hilton, Room 481 during the AES Convention, May 12-15, 1981.

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16-22 Anzac Ave.
P.O. Box 8690
Auckland 1, New Zealand

For additional information circle # 148

www.americanradiohistory.com

New Products

above the fader trough.

The attenuator is a purely digital device that is claimed to introduce no distortion products or noise to the audio signal — a great improvement, Holmes says, over VCAs. Audio level is controlled directly by the digital attenuator, in such a way that all the audio signal sees in its path is a passive device. Resolution is said to be better than 0.38 dB, dependent on how fast your finger is moving in the fader trough.

It goes without saying, Holmes emphasizes, that in the future all Sphere "Datalog" Automation Systems will be based on the digital fader package. The digital attenuation system interfaces directly via an 8-bit word to any computer handling automation duties; no analog-to-digital converter is involved, coming or going. Sphere is also planning to introduce retrofit computer automation for "most" older VCA-equipped automation consoles.

The Sphere Digital Fader is described as representing the next logical step in advanced console design, and is available from the company in groups of four faders, or on an OEM basis.

SPHERE ELECTRONICS, INC.
20201-A PRAIRIE
CHATSWORTH, CA 91311
(213) 349-4747

For additional information circle # 149

NEW RANGE OF CONCERT SOUND MIXERS FROM JIM GAMBLE ASSOC.

After two years of on-the-road tests by acts such as Willie Nelson, The Doobie Brothers and Kenny Loggins, to name but a few, according to the company, the HC40-24 House and SC32-16 Stage Consoles are now available on a custom order basis. The HC40-24 console features 40 inputs, 16 submasters and eight effects outputs, and the SC32-16 provides 32 inputs and 16 outputs.

Features of the consoles include: unique transformerless discreet-hybrid front ends; inputs with three bands of overlapping full parametric EQ, and low-cut filters; outputs with four bands of overlapping full parametric EQ (effectively eliminating the need for outboard equalizers); nine programmable group muting functions; built-in spectrum analyzer and pink-noise generator; four-function LED VU meters; ultra-wide bandwidth of 2 Hz to 20 kHz; and ultra-low distortion of 0.005% THD.

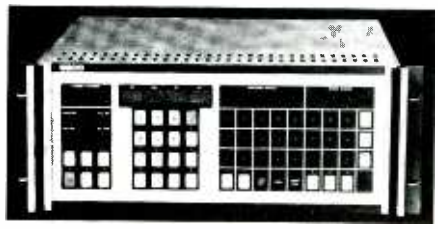
JIM GAMBLE ASSOCIATES, INC.
500 S. SEPULVEDA BLVD. #306
MANHATTAN BEACH, CA 90266
(213) 372-4691

For additional information circle # 150

EECO INTRODUCES ENHANCED VERSION OF MQS-100A SYNCHRONIZER

The new model of EECO's microprocessor-based SMPTE/EBU time-code synchronizer is said to be equipped with several new features designed to increase the efficiency, precision and flexibility of video or audio tape production. Enhancements include transfer of time code information from any machine to any cue or event register; variable pre-roll times; event offset capability; three "scratch-pad" memories accessible from the keyboard; and the ability to make mode changes on-the-run.

In addition to its use in marking cue points, the MQS-100A's *Store Direct* command can now be used for on-the-fly capture of selected tape time from any enabled transport. The keyboard display is then transferred into scratch pad memory, or one of several cue points or event registers.



Cue Search is available with a pre-roll option that allows all machines to cue to a time equal to their entered cue point, minus a user-specified time interval. The pre-roll option is said to be invaluable when the cue point is selected as a main entry point, and all machines must be synchronized prior to this point.

With the MQS-100A, three events can be programmed, each with its own time designation, and time offsets specified for events one and two. Typically offsets are used for "punch-in" recording to accommodate record/erase delays. In addition, a third special event has been added which automatically enables, rolls and synchronizes Machine #3 when the Master Time Code reaches the stored event time.

Three scratch-pad memories are provided for temporary storage of time-code values. Time-code values may be transferred to memory from a variety of other registers via the keyboard display register.

The operating mode for any transport can be changed while system operations are in progress and, with few exceptions, there is no need to place the system in stop mode prior to performing mode changes.

The MQS-100A Series Synchronizer is priced from $13,900.00.

EECO, INC.
1601 EAST CHESTNUT AVENUE
SANTA ANA, CA 92701
(714) 835-6000

For additional information circle # 151

NORTRONICS INTRODUCES COMPLETE LINE OF TAPE CARE PRODUCTS

Called the Proformance Series, the new product line is aimed specifically at the needs of the audio professional. According to Ken Lubitz, director of marketing for Nortronics' Recorder Care Division, "the new Proformance Series will be offered in response to the demands of the professional audio marketplace."

The Proformance Series includes bulk erasers, alignment tapes for studio and broadcast use, head demagnetizers and an array of head cleaners, splicing products and more. Perhaps the most innovative product in the line, according to the company, is the model PF-380 Broadcast Cartridge Head Degausser, said to be the only product of its kind on the market.

Head Cleaning:

Nortronics offers the PF-116 and PF-132 liquid head cleaner. The former is packaged in an aerosol can with a carbon dioxide propellant. The cleaning substance is a TF (trichlorotrifluoroethane) solvent, which is

described as harmless to both the user and to plastics, rubber, metals, painted surfaces, epoxies and elastomer parts. Its extremely low surface tension and high density removes the most stubbornly impacted dirt and oxide deposits. It leaves no residue and contains no silicone lubricant.

Demagnetizers:

The PF-205 Head Demagnetizer will be familiar to users of its counterpart in the Recorder Care line. This model is different, however, in that it has a bend at the tip of the demagnetizing rod, which permits easier access to hard-to-reach head stacks. The PF-380 Broadcast Cartridge Head Degausser is designed for broadcast facilities that operate stacks of cartridge machines.

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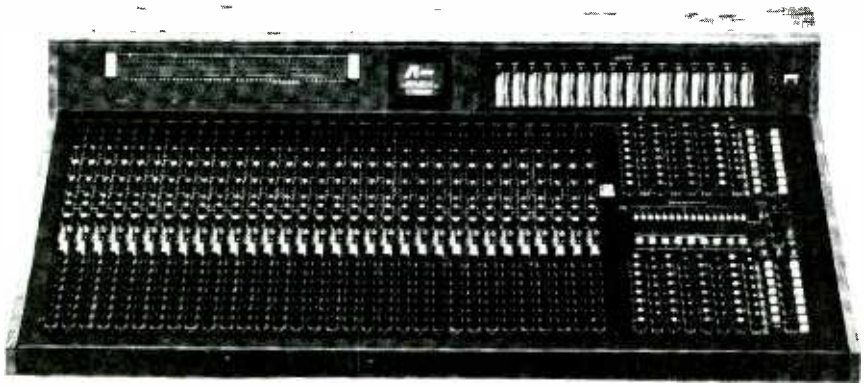

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Pick a number from 9 to 52!

You've just chosen the ideal DC voltage to phantom-power these new ATM electret microphones.

Introducing four "universal" phantom-powered electret microphones. Designed to work from external power, internal regulation automatically handles any voltage from 9 to 52 VDC without adapters, switches, or rewiring. Just plug in and enjoy. With current drain a mere 0.3 mA at 9 volts (4 mA at 12-52V) a 9V battery lasts thousands of hours, not just the 60 or 70 hours typical of other mikes.

When your power supply isn't available, or isn't enough, use ours. The new AT8501 Dual Battery Supply holds two 9V batteries. One to use, and one in reserve. Instant switchover and test LED eliminates guesswork. And spares are as near as the closest shopping center. Neat!

But convenience and versatility are just two of the advantages of the new ATM models. All-new electronics provide plenty of headroom inside the microphone with no more than 1% THD even when used in acoustic fields of 141 dB SPL. Which sets new standards for clean sound even close-up to big brass or inside a powerful drum kit.

And the sound you hear is wide-range and *musical*. Presence without peaks. Highs to 20,000 Hz but without a raspy "edge." Yet despite their responsiveness, these new ATM microphones have the "Road Tough" reliability proved so often on stage and in the studio.

Before you add another microphone, compare our sound, our convenience, our reliability, and our cost. Write for literature and list of nearby ATM microphone specialists. Get great sound...right from the start! AUDIO-TECHNICA U.S., INC., 1221 Commerce Drive, Stow, Ohio 44224. (216) 686-2600.

audio-technica®

For additional information circle # 152

www.americanradiohistory.com

New Products

Bulk Erasing:

Nortronics' range includes the PF-211 hand-held and PF-250 table-top audio/video bulk erasers. Attractively designed and simple to operate, the PF-250 puts out a powerful A.C. magnetic field to completely degauss any reel-type or cartridge, audio or video tape. Field testing indicates that the unit will degauss tapes to a level of -80 dB or better.

Alignment Tapes:

The Proformance line will offer three alignment tapes: a ¼ inch reel-to-reel, AT120; a cassette format, AT200B; and a broadcast cartridge type, AT320B. All three tape are first generation master recordings. One feature shared on the three tapes is a sweep tone for testing stereo phasing.

Head Lapping:

Perhaps one area where engineers most fear to tread is that of head lapping. Most prefer to send their expensive head stacks out to a service center, trading the service cost off against the reduced risk of damaging a costly head. Nortronics contends that lapping need not be feared. Rather, they say, it is a practice that any technician can master. The PF-707 is a simple kit, including a heavy base and frame into which one of several sheets of ultra-fine-grained lapping film is inserted. The kit comes with complete instructions on the proper motions to be made in lapping, and some pointers on how to test for the kind of head wear that lapping might remedy.

NORTRONICS COMPANY, INC.
RECORDER CARE DIVISION
8101 TENTH AVENUE NORTH
MINNEAPOLIS, MN 55427
(612) 545-0401

For additional information circle # 153

AUDIO & DESIGN UNVEILS TRANSDYNAMIC TRI-BAND AUDIO PROCESSOR

The Transdymanic Stereo Processor is a new concept for master processing prior to disk-cutting, tape duplication or transmission. The unit provides all the necessary facilities for sophisticated tri-band processing in conjunction with any professional level-control amplifiers. Normally sold as an ADR Compex Express, or Easy-Rider package, the unit is also, available separately for use with other compressors-limited.

The Transdynamic facilitates separate processing of high-, mid- and low-end bands, avoiding modulation effects, and enabling the setting up of dynamic equalization curves (for example, HF and LF selective limiting to avoid overload on RIAA disk curves).

Both 12 dB per octave and 6 dB per octave *phase compensated* splitting is available; the former allowing twice the dynamic reduction before band-spread reduces the effective operation. The re-combined signal may be further processed through a super-quality wide-band limiter (stereo coupled if required), and an ADR constant current clipper for absolute peak control. Both of these sections can be equalized to provide 25, 50, and 75 microsecond shaping prior to pre-emphasis in the transmitter or disk-cutting amplifier. For AM transmitters, optional asymmetry in the limiter/clipper is available.

Internal calibration systems simplify the line-up of external units for both conventional compression/expansion and the establishment of dynamic filtering/equalization curves. Bargraphs indicate return levels before re-combining and stereo peak limiting. An LED indicator shows the operation of the clipper circuit. A peak program meter, switchable to both or either channel, shows output levels and can be calibrated for following equipment.

Recommended list prices range from $2,400 for the Transdynamic processor, to $6,000 for a Transdynamic package with three F760X stereo Compex-Limiters.

AUDIO & DESIGN RECORDING, INC.
P.O. BOX 786
BREMERTON, WA 98310
(206) 275-5009

For additional information circle # 154

NEW DIGITAL LOOP EDITING SYSTEM FROM AMS

DMX 15-80 Series digital delay lines and pitch-shifters can now be fitted with a "Loop Editing System". L.E.S. is the friend of every engineer who has spent hours editing and splicing tapes to create vocal/backing/drum loops. With L.E.S. musical information can be captured in the system memory, and non-destructively edited via the keypad. Loops may be run continuously, or triggered for special effects and drop-ins. It is also possible to "varispeed" the loop for tempo or pitch corrections.

ADVANCED MUSIC SYSTEMS
WORSTHORNE VILLAGE
BURNLEY, LANCS.
ENGLAND
0282-36943
or, in the U.S.—
QUINTEK DISTRIBUTION, INC.
4721 LAUREL CANYON BLVD.
SUITE 209
NORTH HOLLYWOOD, CA 91607
(213) 980-5717

For additional information circle # 155

NEW PZM MIKE FROM CROWN OFFERS EXTENDED BASS RESPONSE

The new PZM™31S has a new frequency response curve, and serves to complement the 30GP model. It offers a frequency response extended further on the low-end, and on the high-end the 31S gives a warmer, smoother sound — as contrasted with the 30GP, which has a bright, crisp sound.

Like all PZM microphones, the 31S contains a pressure-calibrated capsule that is positioned close to the boundary defined by

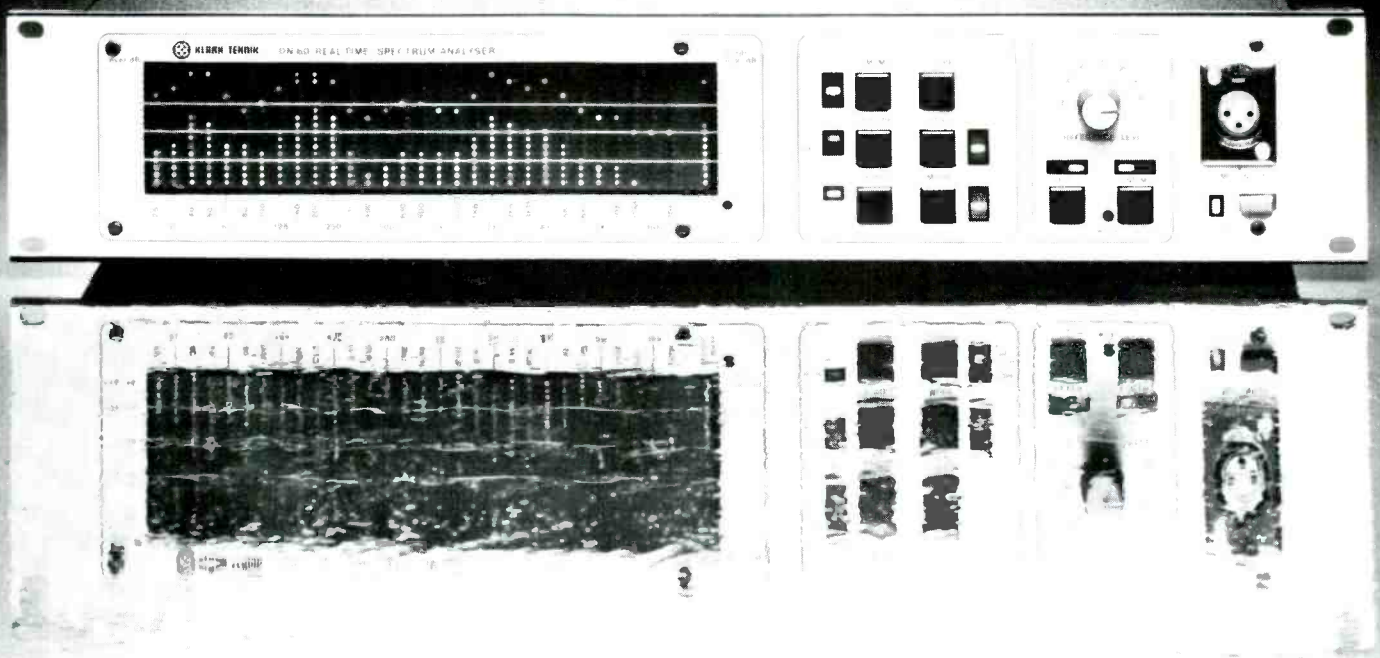
the plate and the surface on which it rests. Direct and reflected waves are in phase at the boundary. Placing the capsule in this position limits comb filtering, and improves reach and clarity. The design also develops a hemispheric pickup pattern, with the result that the tone quality of moving sound sources does not change.

Recommended user price is $350.00.

CROWN INTERNATIONAL
1718 W. MISHAWAKA ROAD
ELKHART, IN 46517
(219) 294-5571

For additional information circle # 156

www.americanradiohistory.com



"REFLECTIONS OF YOUR SOUND JUDGEMENT"

The "DN60 REAL TIME ANALYSER" is the heart of a new audio measurement system from the engineers at KLARK-TEKNIK and is the perfect compliment to the new DN27A Equaliser shown below. Using Micro-Processor based circuitry, the DN60 is capable of performance checks on virtually any audio equipment, and is especially well suited for aligning audio tape recorders. On-site performance verification, whether of a 10,000 seat arena, or a studio control room, is easily facilitated with the DN60; and is an excellent method of building your customer's confidence.

If you're a recording or broadcast studio, include the RT60 Option and provide quick and accurate alignment for your reverberation systems (plates, springs, digital). The DN60 incorporates a pink noise source internally, and occupies only 3½" (2U) in a standard 19" rack.

If you take your sound on the road, the DN60 can help make that 5 p.m. sound check go easy, leaving enough time for a quick dinner before showtime. With the inclusion of Three Memories, and a Peak-Hold function, you can expand the scope of your sound check, and provide that extra edge of excellence.

The DN60 is Micro-Processor technology at a price you will like.

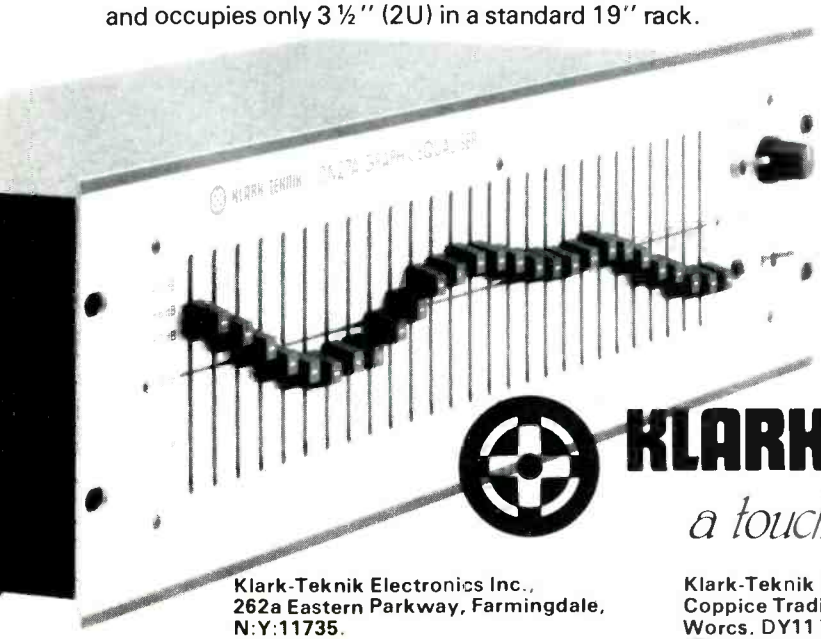
Other useful features include:- "A" Weighting , Average or Peak Reading and Selectable Response Time.

DN60 Options:- • Calibrated microphone • RT60 (Reverberation time) package • X/Y Plotter and oscilloscope interface • Dot matrix printer interface.

Now complete your system with the new DN27A ⅓rd OCTAVE EQUALISER and quickly adjust your sound to perfection.

The new DN27A is the successor to the DN27, acclaimed world-wide as the industry standard in graphic equalisation. New features include improved headroom, earth lift facility and fail-safe system bypass plus the legendary reliability and performance of it's predecessor.

Please contact us and get our DN60 and DN27A data sheets and related literature.



KLARK-TEKNIK

a touch of class

Klark-Teknik Electronics Inc.,
262a Eastern Parkway, Farmingdale,
N.Y.11735.
☎ (516) 249–3660.

Klark-Teknik Research Ltd.
Coppice Trading Estate, Kidderminster,
Worcs. DY11 7HJ England.
☎ (0562) 741515 Telex: 339821

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Company .....

Address .....

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I'd like to contact my nearest distributor ☐

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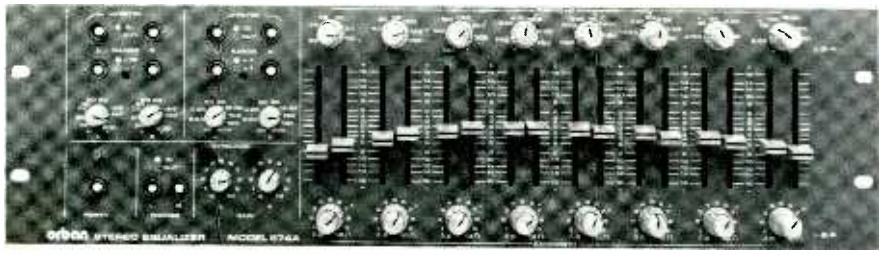


MODEL 647A STEREO EQUALIZER FROM ORBAN

A dedicated split-stereo version of the well-known 672A equalizer, the new unit features eight bands of EQ, graphic-style controls, and continuously variable center frequency and bandwidth for each band.

Wide-range high- and low-pass filters with 12 dB per octave Butterworth slopes follow the EQ section, which can be used as independent, tuneable two-way electronic crossovers.

The space-saving 647A offers the features of two complete mono 672As in the same panel space; ganged controls make one-hand stereo operation easy. Each of the eight bands tunes over a 3:1 frequency range, and offers 16 dB of cut or boost with reciprocal curves. Typically the 'Q' or bandwidth can be varied between 0.3 and 20 for extra-narrow notches.

The high- and low-pass filter sections are continuously tuneable over a 100:1 frequency range in two decades. Each section is independently switchable. A separate output for each filter enables use as a crossover.

Inputs are electronically balanced; outputs are unbalanced as standard, although a balancing option can also be supplied. Nominal output level is +4 dB, with the maximum output level before clipping being greater that +19 dBm. Total noise at the output is less than -78 dBm, giving a dynamic range of greater than 97 dB. THD and SMPTE intermodulation distortion are both quoted as being less than 0.08% at +18 dBm output.

Suggested list price is $1,149.00.

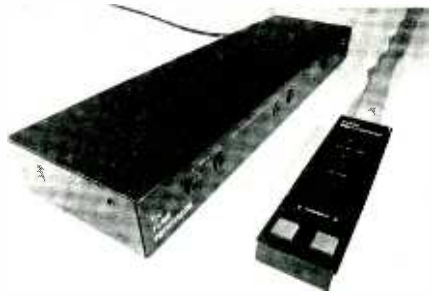
ORBAN ASSOCIATES, INC.
645 BRYANT STREET
SAN FRANCISCO, CA 94107
(415) 957-1067

For additional information circle # 158

NEW REVERB PROCESSOR FROM BANDIVE

Using various dynamic range processing techniques, Bandive's new Time Processor system enables the decay time of any reverb unit to be doubled or halved in four preset steps. The device will interface with any mono or stereo reverberation unit, although it was originally intended for use with Bandive's *Great British Spring* stereo reverb.

A rack-mounting or free-standing electronics package is connected in line with both echo send and return paths. A simple alignment procedure puts the unit into full operation within a matter of minutes.



A separate console-mounting or hand-held remote control unit features an LED display and sequencing buttons for each channel, offering the facility of variable decay — a feature claimed to be previously available only on units costing many times the price.

Production delivery will commence in early June at an expected cost of approximately $600.00.

THE MIKE SHOP
P.O. BOX 366T
ELMONT, NY 11003
(516) 437-79251

For additional information circle # 159

In keeping with our reputation for manufacturing only the highest quality recording consoles, Speck Electronics introduces:

The "SPECKMIX 16"

A New 16 Input, 8 Output Recording Console for Under $3,000

Features

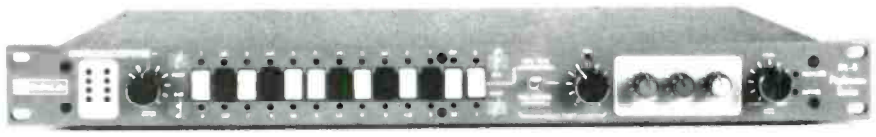
- Retail Price $2,975.00
- 8 mixing buss outputs
- 8 large VU meters (ASA standards)
- 8 track panable assign
- 4 frequency 3 band equalizers
- Low noise transformerless mike inputs
- Control room and studio playback
- Talkback and tone prompts
- Independent stereo mixdown buss
- Echo and cue busses
- All operating levels are +4 DBM
- Standard input and output connections
- Stylish European color coded knobs
- Solid oak side panels

SPECK ELECTRONICS

7400 GREENBUSH AVENUE (213) 764-1200
NORTH HOLLYWOOD, CALIFORNIA 91605

For additional information circle # 160

www.americanradiohistory.com



Each equalizer is comprised
bands: high-frequency shelvir
frequencies, and two mid-frequ
sections each with 16 frequ
section has a range of ±16 dB. S
ratio is claimed to exceed

. . . Continued over

DL-5 HARMONICOMPUTER™ DIGITAL EFFECTS UNIT FROM DELTALAB RESEARCH

The Harmonicomputer is a special effects and pitch-shifting device that features keyboard-type controls for precise, easy to select, musical intervals. The front panel consists of an arrangement of rocker switches set up to simulate a keyboard, enabling the user to control the desired harmony in common musical intervals. A recording engineer has the option of disabling the keyboard facility, and using the fine-tune control as a full two-octave, continuously variable sweep pitch control.

A feedback control, which recirculates the harmony, is used to create chords and/or an arpeggio effect. This is said to become even more impressive when used in conjunction with an external delay unit, such as the DeltaLab DL-4 Time Line™. A full vibrato control is provided to give the musician or recording engineer the flexibility to create "new dimensions in natural-sounding harmony". The Harmonicomputer is said to provide virtually distortion-free 20 Hz to 15 kHz bandwidth and 90 dB dynamic range.

U.S. suggested retail price: $1,985.00.

DELTALAB RESEARCH, INC
27 INDUSTRIAL AVENUE
CHELMSFORD, MA 01824
(617) 256-9034

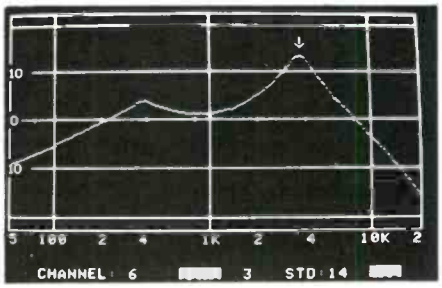
For additional information circle # 161

REDWOOD RESEARCH COMPUTER-CONTROLLED EQUALIZER

The PARAM system consists of a dedicated microprocessor-controlled unit that controls up to 64 individual equalizer channel modules. All operator input is by means of a single 9- by 6-inch control panel. System operation is monitored via an interactive graphics display on a high-resolution video monitor. System displays include exact frequency response curves of each equalizer, and data presented in tabular form regarding the status of each EQ section, system memories, and system status.

Changes in equalization setting are made by drawing or altering the displayed equalizer response curve. The system computer then optimizes the six filter sections, sets the equalizer, and displays the resultant response curve. All operations are in real-time, and no delay is said to be perceived by the user.

System memories retain up to 64 settings for each equalizer, and 32 "standard" response curves that the operator previously stored. The entire system can advance from memory setting to memory setting in 20 milliseconds. Interfaces to existing console level control automation are also available. SMPTE time-code systems are currently under development.



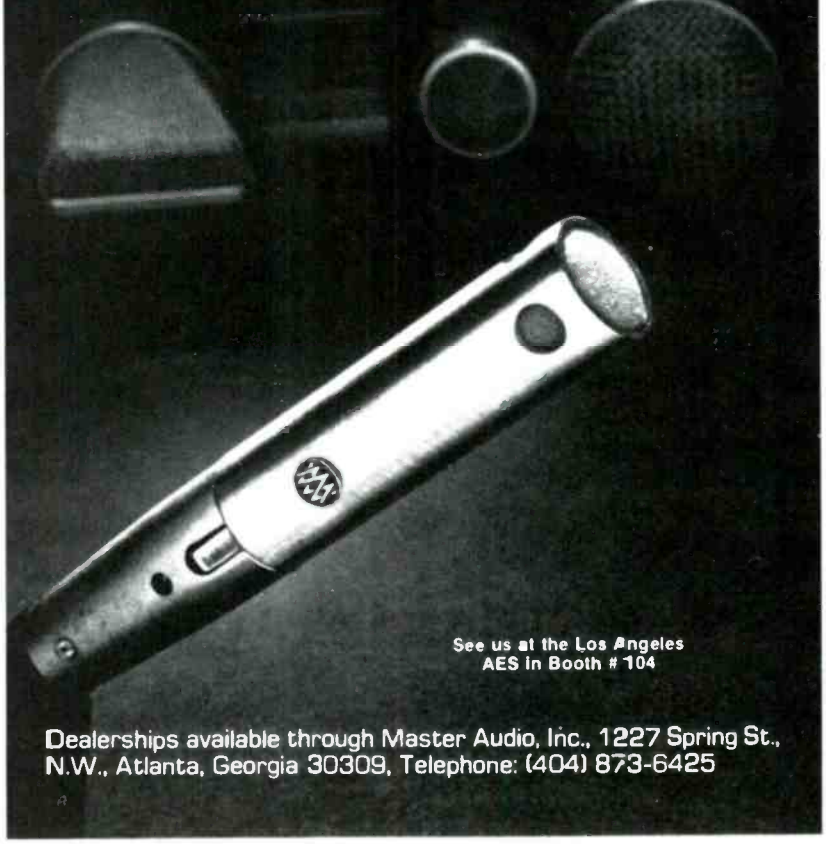
WRIGHT vs MIGHT

Now The State of the Art Sounds Better

You know your ears mean business. You trust your living, your reputation and your future to your professional ability to tell the difference between great and better-than-great. So take this challenge. Compare the Wright Mic to the best mics on the world market.

Plug them in, place them and compare. You'll HEAR a new transparency . . . clarity . . . a big capsule sound in a miniature. You'll experience the NEW State of the Art.

For a professional demonstration call: Audicon Inc., Nashville, Tn. (615) 256-6900; Milam Audio Corp., Pekin, Il. (309) 346-3161; Martin Audio, New York, N.Y. (212) 541-5900; Audio Technologies Group, Los Angeles, Ca. (213) 939-4940



See us at the Los Angeles AES in Booth # 104

Dealerships available through Master Audio, Inc., 1227 Spring St., N.W., Atlanta, Georgia 30309, Telephone: (404) 873-6425

For additional information circle # 162

www.americanradiohistory.com

New Products

Redwood Research's unique digital/analog interfacing techniques result in switching noise below -88 dBm.

Long-term permanent storage of all system data on cassette or audio tape is a standard feature. An optional disk storage system is also available with a capacity of 500 system storage files. Each file contains all settings for all equalizers in the system, as well as "standard" curves stored by the operator.

The PARAM system, which was designed in West Germany, is being manufactured in Nashville by Redwood Research, Inc., and can be seen at the Los Angeles AES Show in booth 104. Exclusive sales and marketing for North and South America is being handled by:

AUDICON MARKETING GROUP
1200 BEECHWOOD AVENUE
NASHVILLE, TN 37212
(615) 256-6900

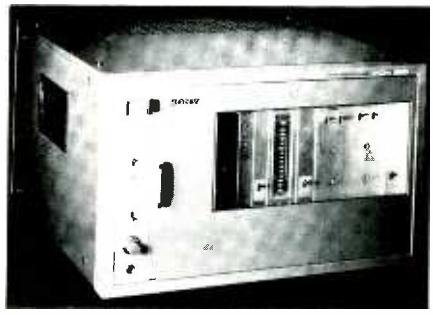
For additional information circle # 163

SONY INTRODUCES PCM-1610 DIGITAL AUDIO PROCESSOR

As with the earlier PCM-1600 unit, the two-channel, 16-bit PCM-1610 provided better than 90 dB dynamic range, distortion less than 0.05% over the entire audio spectrum, and unmeasurable wow and flutter. The PCM-1610 also incorporates such new features as an SMPTE time-code generator, a switchable transformer/transformerless function on inputs and outputs, and a variable mute time selector for protection against bit errors.

The new processor is claimed to further establish the advantages of digital over analog recording. Wow and flutter are eliminated by the absence of any mechanical functions in the actual recording; noise-reduction systems are unnecessary because of absolutely no hiss or print-through; and the much greater dynamic range makes limiting and compression a matter of choice, not a necessity.

Since the PCM-1610 utilizes Sony broadcast U-Matic videocassette recorders for storing digital information, the unit incorporates an advanced error-correcting code. Known as Cyclic Redundancy Check Code, it protects against any drop-out, analyzes and replaces missing information, and eliminates any pulse noise or crossword error. With the addition of a mute selector, the system protects against the hazards of bit errors.



The automatic SMPTE time-code generator allows immediate editing and assemblage of recorded material, utilizing the new Sony DAE-1100 Digital Editor, or with a video editing console. Since digital tape-to-tape dubbing reproduces clone-perfect copies, there is no generation loss in re-recording, no degredation of signal during the editing process, and uniform mastering of unlimited pressed disks is assured.

The PCM-1610 utilizes 16-bit linear quantization, said by Sony to be the accepted professional standard. Tapes that have been made on existing PCM-1600 Digital Processors are totally compatible with the new PCM-1610.

SONY PROFESSIONAL AUDIO DIV.
9 WEST 57TH STREET
NEW YORK, NY 10019
(212) 371-5800

For additional information circle # 165

NEW LYREC MASTERING RECORDER

The new Lyrec TR55 is built in a very compact and ergonomic design, and is said to be well suited for mastering, editing and mobile applications. The tape deck accepts any reelsize from 3 to 14 inches in any combination. A new servo-controlled D.C. discmotor has made it possible to achieve a winding speed of 500 IPS. Reel motors operate in a double push-pull system, so that tape tension is kept within close tolerance even in extreme situations. All mechanical movements are said to be smooth and silent

GOOD ADVICE!
FROM PRS

THE OTARI MTR-90

PRS is proud to have been selected New England's exclusive MTR-90 dealer.

Good Advice affects the success of your activities, which directly affects the success of ours.

PRS INC
Professionals helping Professionals

Professional Recording & Sound, 1616 Soldiers Field Road, Boston, Mass. 02135 Telephone (617) 254-2110

For additional information circle # 164

www.americanradiohistory.com

in operation, due to new servo-controlled solenoids. The overall result is a performance that is extremely smooth, fast and accurate.

Editing facilities are beyond what is normally expected on a tape machine. Apart from edit and dump-mode facilities, to locate edit-points a search system is provided to search to either cue or zero. The actual cutting is done by a built-in tape cutter mounted in the head block, and which actually cuts right in front of the headgap.

The Lyrec TR55 is built in a true modular fashion. A single screw will provide access to all parts, and no subassembly is mounted with more than four screws.

LYREC MANUFACTURING A/S
HOLLANDSVEJ 12
DK-2800 LYNGBY, DENMARK
(02) 87 63 22

For additional information circle # 166

NEW ICC 3000 MODULAR CONSOLE FROM INTERNATIONAL CONSOLES

Each and every function of the ICC 3000 audio control console has been or into it's own module, which can b plugged into the cabinet. The cabine expanded at any time to acce reasonable number of modules. More than 11 years of research and development are said to have gone into designing the console's circuitry, including a radical re-designing of audio control rooms in an effort to completely evaluate the audio integrity of these new circuits. Seven patents cover this new technology.

The design is executed by making sure that every kind of voltage and ground connection is available at the plug-in connector on each module; in this way circuitry of any description may be easily accommodated by the system at any time. Plug-in modules and sub-modules also make repair easy to carry out.

Customization is accomplished by having modules available for every function, and a cabinet that expands or contracts to accept any reasonable number of modules. Any number of tape tracks, tape machines, effects-sends, effects-returns, cue or monitor systems can be easily accommodated at any time by plugging in the appropriate modules. Once these devices are hooked into the system, any device can be patched to any other device without the use of a patch-bay.

This new method of patching eliminates all transformers, prevents op-amp destruction due to bad patches, allows for the combining of multiple outputs to feed an input, eliminates ground, impedance and level

. . . continued overleaf —

TEST DRIVE A SOUNDCRAFT

Soundcraft Series 1S. 400, 800, 1624 and 3B and SCM 382 Recorders.

call (512) 824-8781

Before you buy a car you usually check it out first. Kick the tires, listen to the radio, look at the motor and so on. That's only sensible . . . it's a lot of money. So why should you spend lots of money on a recording console just because you saw a pretty picture in a magazine?
We think the Soundcraft console is one of the best you can buy. We're so sure you'll agree we'll even let you "test-drive" one before you buy. Call us for details, or further information.

SOUNDCRAFT ELECTRONICS LIMITED

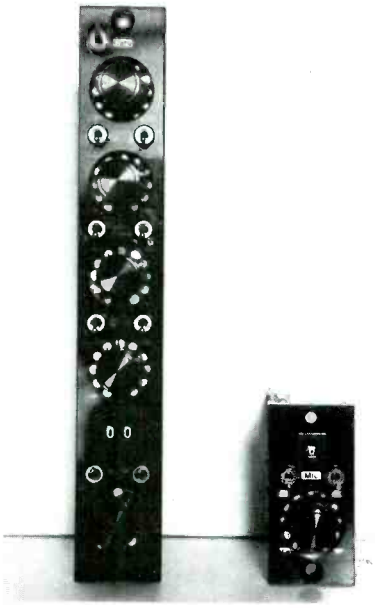
PROFESSIONAL AUDIO EQUIPMENT
P.O. Box 6520,
San Antonio, Texas 78209

For additional information circle # 167

www.americanradiohistory.com

match problems, and gets rid of unsightly patch cables.

System modules may be added together in appropriate order to facilitate the handling of any function of an audio control console. A primary goal in the design of the console was to achieve logical control layout. Controls that are not in use do not light up, while those in use light up in their precise order. By scanning from the top of a channel to the bottom, the operator not only sees what is in use, but also the exact order of the active controls.



Circular-patterned VU meters monitor every active circuit. Meters are positioned below the circuit being monitored, so that any distortion generated anywhere in the system can be instantly found.

A memory system (patent pending) is included in each console, which memorizes control knob settings so that a desired "mix" may be easily reconstructed by merely turning the controls until they illuminate. The control illuminates only when the precise setting held in memory is matched. Unlike other memory systems, this feature is totally separate from the the audio circuitry, so no distortion is added.

Other features said to be unique to the ICC 3000 include: a Mic Damp™ circuit that adds natural peak compression effect to smooth and broaden the attack of percussive instruments; an equalization module with all of the advantages of a parametric equalizer, but for which the signal only flows through two active devices; and a noise gate circuit that disconnects all non-playing channels from the master electronics.

INTERNATIONAL CONSOLES CORPORATION
P.O. BOX 862
PROVO, UT 84601
(801) 377-9044

For additional information circle # 168

MCI JH-110C-8 8-TRACK RECORDER

Sharing the totally transformerless electronics circuitry design of MCI's other products, the new JH-110C-8 also provides as standard equipment a full-function remote control and Autolocator III with 10 programmable scratch-pad memories, TVI (Tape Velocity Indicator) and "Yo-Yo" (shuttle) functions.

Full remote-control of repro/input/sync functions for each channel is provided, as well as remote transport functions. The JH-110C-8 features three speeds (7½/15/30 IPS), standard variable-speed control, and non-magnetic ceramic capstan. Total D.C.-powered circuitry is said to make the

For additional information circle # 169

www.americanradiohistory.com

machine virtually immune to mains voltage fluctuations. The audio electronics include separate equalization and bias settings for each speed, *QUIOR* (Quiet Initiation Of Record) circuitry for noise-free insertions, and NAB/IEC equalization switching (no realignment required). All construction is modular, providing for easy problem diagnosis and maintenance. The JH-110C-8 is available for rack mounting (19-inch standard), or in a rugged cabinet.

MCI
1400 W. COMMERCIAL BLVD.
FORT LAUDERDALE, FL 33309
(305) 491-0825

For additional information circle # 171

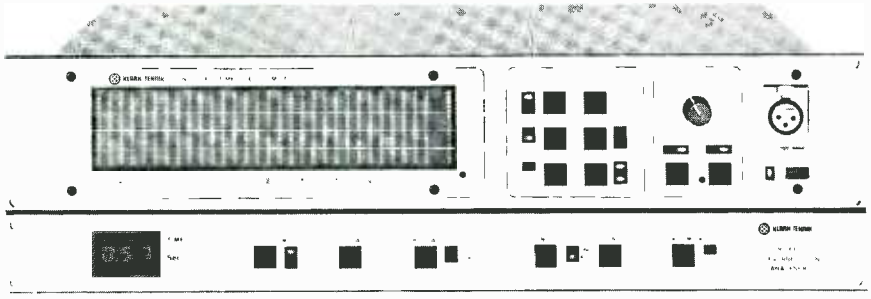
KLARK—TEKNIK REVERB DECAY ANALYZER

The Model RT60 Reverb Decay Analyzer is a highly versatile measurement device to be used with the Klark-Teknik DN60 Real Time Analyzer, and is said to give the user control over many of the parameters of decay analysis. A curser switch allows the choice of measurement using any single ISO third octave frequency or the total bandwidth. The RT60 also allows the user to select any portion of the time window from 0 dB to -30 dB in 2 dB increments. The unit will plot the decay curve displaying the results on the DN60. The choice of 16, 64, or 208 milliseconds gives the user control over the horizontal resolution of the plotted curve. The RT60 also allows the user to accumulate up to 32 curves enabling a true averaging of different point measurements.

The RT60 will be available June 1, 1981, at a suggested retail price of $1395.

KLARK-TEKNIK ELECTRONICS INC.
262 A EASTERN PARKWAY
FARMINGDALE, NY 11735
(516) 249-3660
(outide the U.S)
KLARK-TEKNIK RESEARCH LTD.
KIDDERMINSTER, WORCS. DY11 7HJ
ENGLAND

For additional information circle # 170



EVENTIDE COMPUTERIZED COMPRESSION/EXPANSION TIMESQUEEZE™ SYSTEM

The system utilizes a desktop computer (Hewlett-Packard HP-85 or equivalent) to control an H949 Harmonizer® and PTC945 Precision Tape Controller. The computer makes all recorder/projector motor speed, Harmonizer pitch ratio, and timing calculations automatically. A user need only enter the current and desired running time of the program material. In fact, the computer will even time the program if current running time is unknown.

The user is kept informed of all operating parameters via a small CRT built into the desktop computer. Tape machine status, running speed, timing, and pitch ratio are all available for modification by the operator. Simply touching a "help" key causes the system's operating manual to be displayed on the CRT screen. The unit will even draw

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(214) 741-2027

For additional information circle # 172

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New Products

an interconnection hookup diagram, and aid in trouble-shooting through an extensive self-test sequence.

The Eventide Timesqueeze system provides three schemes of motor control — voltage, frequency and tachometer feedback — to interface with virtually every pro-audio and variable speed-capable videotape and film projector. The unit can also store the operating characteristics of different tape and film transports, thereby enabling a single system to be shifted among various tape/film machines in a matter of minutes.

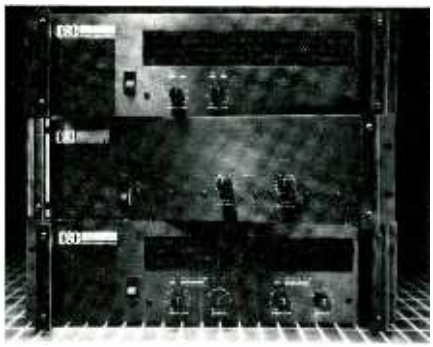
The Timesqueeze System has a professional list price of $8,500.00

EVENTIDE CLOCKWORKS, INC.
265 WEST 54TH STREET
NEW YORK, NY 10019
(212) 581-9290

For additional information circle # 173

UPGRADED POWER AMPS FROM QSC AUDIO PRODUCTS

Improvements have been made to the company's A-20/30/40 Series of power amplifiers, to increase long-term reliability, improve audio performance, and increase user control. Among the changes made were the use of higher grade metal-case driver transistors, gold-plated internal signal level connectors, the addition of a TDI clipping indicator on the standard models, improved



performance of the PowerLimit circuit in the A22/32/42 versions, and conversion of the A-40 series to a fully complementary section. As a result of these improvements, IM distortion has been lowered to 0.02%, and output power at low impedances raised.

QSC AUDIO PRODUCTS
1926 PLACENTIA AVENUE
COSTA MESA, CA 92627
(714) 645-2540

For additional information circle # 174

NOISE SUPPRESSION AND POWER PROTECTION UNIT FROM LINEAR & DIGITAL SYSTEMS

The Model PS-1 is a power line conditioning unit designed primarily for sound-reinforcement systems. A transient suppressor provides protection from high-voltage spikes on the power line, from such sources as lightning strikes to nearby utility poles and inductive (for example, motors and transformers) switching. An R.F. interference filter reduces noise from radio transmitters such as CB and from light dimmers.

Three neon lamps indicate relative phasing of the line, neutral and ground connections, thereby detecting improper wiring and/or grounding of the outlet in use. The latching relay prevents re-application of AC power to loads until the power on switch is manually depressed. This feature allows the user to properly sequence power-up and thereby avoid AMP/speaker damage.

For maximum noise rejection and protection, a PS-1 at both ends of the sound reinforcement system is recommended. If only one is used it should generally be employed at the mixer end, since the loss and re-application of power to the mixer usually results in output signal transients due to large amounts of feedback in EQ circuit stages. However, placement on stage may result in lower overall noise and therfore some experimentation is suggested.

LINEAR & DIGITAL SYSTEMS, INC
46 MARCO LANE
CENTERVILLE, OH 45459
(513) 439-1758

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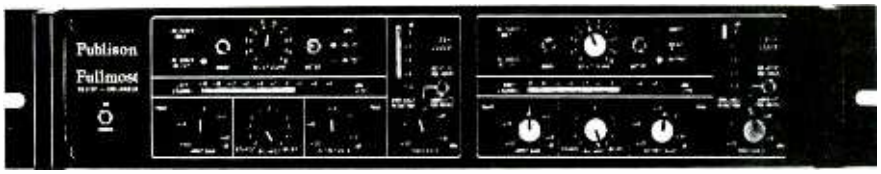


FULLMOST STEREO AUDIO PROCESSOR AND DE-ESSER FROM PUBLISON

When mixing vocals with several instrumental tracks, a voice is often masked by the music and looses intelligibility. A new device from Publison, known as The Fullmost, when inserted in a vocal track, is said to provide clarity and "relief", *without* altering levels. This effect does not change the general balance of a mix, nor does it create peaks and clipping phenomena.

The basic principle is to add to the original sound a "relief" component obtained by delaying harmonic components of the direct sound. A useful effect can be obtained with a relief component 10 to 20 dB below that of the direct level, which possibly explains why overall levels are largely unchanged by the process.

A Relief Slope setting provides several "colors" to adapt it for different instruments (such a violins, cymbals, etc.), and to make them more audible inside the orchestration.

Excessive sibilance can also be removed by the de-esser section of the Fullmost, either alone without relief, or added to the relief effect itself. When sibilance frequencies are detected above a preset threshold level ,a selective compression occurs on frequencies above 5 kHz. Sibilance reduction only takes place if the ratio between sibilance frequencies and the average level exceeds the threshold level. A front-panel LED VU meter displays the amount of sibilance reduction.

PUBLISON AUDIO PROFESSIONAL
5-11 RUE CRESPIN-DU-GAST
75011 PARIS, FRANCE
(0331) 357-6407

For additional information circle # 177

INTEGRATED SOUND SYSTEMS AUDIO TIME COMPRESSOR

Identified as the TDM-8000 Audio Compressor, the unit allows recorded audio material to be played back at faster rates than it was recorded at, with the original pitch remaining unchanged. The system features proprietary patented technology that achieves performance appropriate for first run movies, video taped segments, records, TV and radio commercials, and related applications.

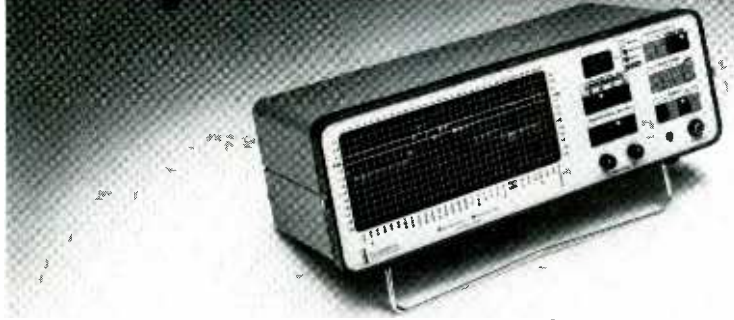
An intelligent splicing system (patent-pending) analyzes the audio signal in digital form, although the program signal remains in the analog domain throughout the process. This technique is claimed to ensure the lowest possible distortion and minimum listening fatigue.

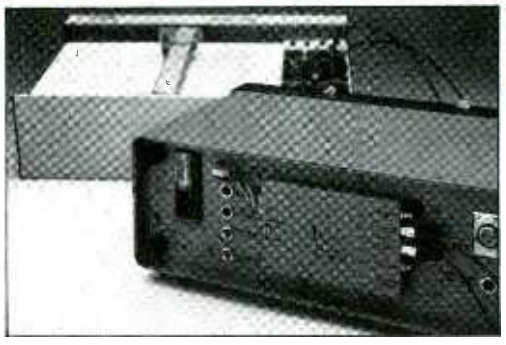
Another unique feature of the TDM 8000 is its ability to process complex program material, such as speaking voice over ambient noise or singers with accompaniment, without intermodulation distortion or the need to band-limit the program material. Other time compressors are claimed to be able to handle only simple waveforms, or the unaccompanied human voice.

. . . *continued overleaf* —

Sophisticated acoustic analysis made simple.

Inovonics' Model 500.





The Inovonics 500 has everything you need for sophisticated real- and reverberation-time acoustic analysis in one, easy-to-use package.

In the real-time mode, the 500 shows you wideband or weighted SPL readings in each one-third octave band from 25 Hz to 20 kHz. In the RT_{60} mode, it displays reverberation time up to 10 seconds with 10 ms resolution, while the LED matrix plots the decay characteristic.

The 500 has a built-in wideband/octave-band pink noise generator and is both AC and battery powered. It's light enough to go wherever you go, and rugged enough to take it.

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For additional information circle # 178

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New Products

Typical applications include the shortening of TV programs to allow extra "free" time for news updates, public-service announce ments, commercials, etc.; to tighten up inteviews with non-professional speakers during news and documentaries; and to time justify films to fit pre-determined time slots with minimal or no editing of the videodisk, video tape, or television broadcast.

The TDM 8000 can be interfaced to track variable-speed playback devices through an external potentiometer, external motor speed circuit command, or motor tachometer. The use of motor/capstan speed tachometer outputs, allows the unit to eliminate start-up wow created when transports come up to speed.

INTEGRATED SOUND SYSTEMS, INC.
29-50 NORTHERN BOULEVARD
LONG ISLAND, NY 11101
(212) 729-8400

For additional information circle # 179

MODEL 1.75 SPMTE EDIT TIME CODE READER FROM J.S.WIENER ASSOCIATES

Requiring only 1⅝ by 4¼ inches of panel space, this self-contained code reader features front-panel selection of either Time Code or User Bits in large 0.3-inch LED displays. Drop-frame flag ("color-timing") is

also decoded, and displayed on the front panel.

Unique circuitry is employed to freeze the display -- a useful feature for off-line decision logging, or to enable/disable the self-contained error bypass logic. Small enough to allow four units to fit side by side in 1¾ inches of 19-inch rack space, the Model 1.75 SMPTE reader will display time code from machines running forward or backward over a wide range of playing speeds.

The unit is supplied wired for either 110 or 220 V A.C. operation, with external connections for alternate power sources or 6-10 V A.C., or 8-13 V D.C. Suggested list price: $495.00.

J.S.WIENER ASSOCIATES
4440 N KEDZIE AVENUE
CHICAGO, IL 60625
(312) 478-2666

For additional information circle # 180

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BANDIVE ACCESSIT PROCESSORS NOW DISTRIBUTED BY SPECTRE AUDIO SYSTEMS

The Accessit line of professional audio signal processors and accessories manufactured by Bandive Ltd., England, presently includes a spring reverb; a compressor with adjustable attack and release times, and a 30 dB dynamic range; a two-band adjustable frequency parametric equalizer; a compander noise-reduction system; and a four channel buffer/distribution amplifier having 10 dB of gain.

Each product is housed in its own companct 5¼- by 5¼- by 1¼-inch case. All units operate from an accessory power supply in the same size case, capable of powering up to four Accessit devices.

Retail price is $108.00 for each Accessit signal processor, and $93.00 for the power supply. An optional rack mount kit will hold any three Accessit signal processors in 3½ inches of rack space.

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HOLLYWOOD, CA 90046

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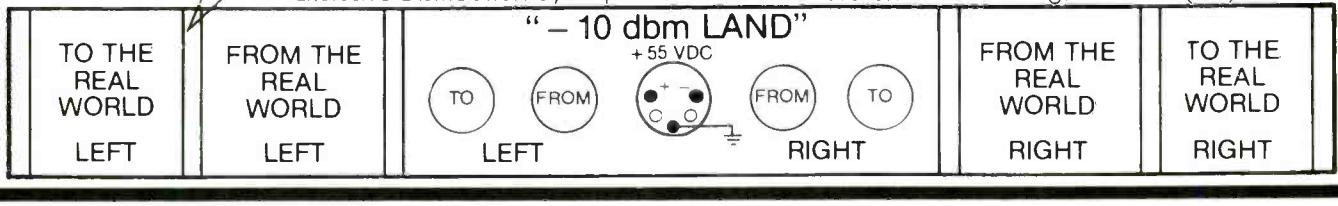

For additional information circle # 182

www.americanradiohistory.com

NEW CARVIN BUYER'S GUIDE SPOTLIGHTS MX1608 MIXER

Special features of the 16-in/8-out mixing console include eight fully assignable outputs; three send busses, 3-band active EQ; and a separate 8-track to 2-track mixdown system complete with independent level and pan controls for each main output.

Other main points include large professional 90-mm faders; phantom-power supply; channel solo and mute switches; and mike/line switches with direct channel outputs for channel patching.

The MX1608 sells for $2,495, plus $235 for an Anvil case.

CARVIN MANUFACTURING CO.
1155 INDUSTRIAL AVENUE
ESCONDIDO, CA 92025
(714) 747-1710

For additional information circle # 183

EDCOR AM400 AUTOMATIC MICROPHONE MIXER

Essentially, the AM400 Automatic Mixer is a hybrid of digital control and analog circuitry. Attack time for each channel is said to be too fast to be noticed in the form of "clipped" consonants. Timed release on each channel input negates both clipping and distortion of trailing audio sequences.

External front-panel features include four individual gain controls, a master gain control, a power on/off switch, and an automatic/manual mode switch. Two sets of four recessed individual attack threshold and attenuation depth controls are also provided. Up to seven units can be "daisy-chained" together, providing control for up to 28 inputs; the first unit becomes the master, and the other six the slaves.

Variable depth of attenuation controls are offered for each input. Instead of turning each channel completely off or on, this facility allows the user to turn "off" each channel by degree. For example, Channel #1 could be turned off by 20 dB, Channel #2 by 50 dB, and so on. This facility is said to effectively establish a floor gain setting per individual channel, and give a combined floor gain setting when all channels are off.

In the event of a user misadjusting or not understanding operation of the AM400, the mixer can be switched to manual-mix operation. The Edcor AM400 carries a suggested list price of $500.00.

EDCOR
16782 HAVE AVENUE
IRVINE, CA 92714
(714) 556-2740

For additional information circle # 185

SOUNDCRAFT SERIES 2400 AUTOMATION—READY CONSOLE AND 24-TRACK MACHINE

On display for the first time in the United States at May's Los Angeles AES Show, the new automation-ready console features 28 input channels, with full routing to 24 group outputs. The console is available with a choice of VU meters or an optional LED bargraph metering system, with switchable peak or VU characteristics.

Also on show will be the SCM-382 24-track on two-inch machine, which features vey low wow and flutter, low noise performance, and compact size. Varispeed and search-to-zero facilities are standard, as are separate sync outputs for each track. Other useful features include a 10-memory, microprocessor-

EXPANDABILITY

Continuing our Policy of ever increasing the versatility of the DMX Series of AMS are pleased to announce the DIGITAL LOOP EDITING SYSTEM. Delay/Pitch changes, L.E.S. is the friend of every engineer who has wasted hours splicing and editing tapes together to make vocal instrument /drum loops. Now the job is simplicity itself and once information is stored in the memory of the DMX unit, editing may be carried out simply by means of the delay keypad. The pitch changer can be used to "varispeed" the pitch of the information stored and the loop can be run continuously or triggered instantaneously for drop-ins.
This facility is available as an update to both the DMX 15-80 & the DMX 15-80S systems.

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Suite 209, North Hollywood,
California 91607.
Telephone:[213] 980-5717

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controlled autolocator, and remote-control unit.

Eight- and 16-track versions of the SCM-381/2 transport are currently in use at several European studios, and on the road with such notables as Pink Floyd and Frank Zappa.

SOUNDCRAFT ELECTRONICS US
20610 MANHATTAN PLACE #120
TORRANCE, CA 90501
(213) 328-2595

For additional information circle # 186

TASCAM DEBUTS M-35 8-TRACK MIXER

The new modular mixing console is equipped with eight mike/line inputs, four bus outputs, and an independent 8-track monitor mixer. Microphone inputs are transformer-isolated. The M-35 also features an 8-track cue system, four effects returns, and direct outputs on each input channel.

Equalization on the input channels is the parametric sweep type. Either of two low-frequency ranges can be selected (60 to 400 Hz, or 400 to 1.5 kHz), as well as either of two high-frequency ranges (1.5 to 7.5 kHz, or 7.5 to 12.5 kHz). Boost or cut for both sections is 12 dB.

If more input channels are desired, an expander is available offering up to an additional 12 mike/line inputs. A talkback module is also available.

"Naturally, we see the M-35 as the perfect complement to the Tascam 80-8 multi-channel recorder," says Dave Oren, TEAC marketing manager. "But it's flexible by design to suit a number of needs: 4-track, 8-track, studio or solo work."

TEAC CORPORATION OF AMERICA
7733 TELEGRAPH ROAD
MONTEBELLO, CA 90640
(213) 726-0303

For additional information circle # 187

XE-1 ELECTRONIC EDITOR FOR MITSUBISHI PCM RECORDERS

The XE-1 is said to offer extremely precise control of editing by means of a cue-display unit or dial, with a digital fader to set recording levels, and freely selectable cross-fading at any point during the tape. In addition to all the functions normally provided by editors, the XE-1 also features a CRT display that identifies the editing point, and a built-in mini-printer — two features said to be invaluable during complex mixdown and editing sessions routines that

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audiotechniques equipment exchange

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For additional information circle # 188

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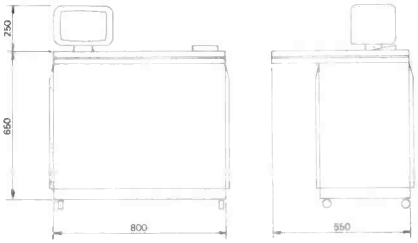
extend over a period of several days. The unit can control up to three Mitsubishi X-80/X-80A mastering recorders, enabling a master tape to be produced from any number of original tapes in the minimum of time.

Cut-and-splice editing comes into its own when a part of one take must be inserted in another that is paced slightly differently; no electronic editor can reconcile the differences in performance time. The combination of electronic editing with well-proven cut-and-splice techniques, Mitsubishi claims, constitutes a powerful system that ensures the very highest quality master tapes.

One unusual feature of the XE-1 is its ability to control a pair of X-80 or X-80A digital machines, synchronizing them so that they can record and playback four channels of sound on the two separate stereo-channel pairs. Editing points can be identified by digital and analog cues. The new editor permits the actual PCM signals to be monitored at rated speed (so-called "digital cueing"). At the same time it exploits the unique advantages of fixed-head tape decks, by offering signal monitoring at low (i.e., non-synchronous) speeds, using the auxiliary analog cue tracks, and thus simplifying the location of editing points.

In digital cueing, the general location of an editing point can be indentified by monitoring the PCM signal, at which stage the PCM data immediately preceding and following this point is stored in the XE-1's editor memory. The cue "dial" is then used to playback this



Dimensions and General Appearance of the XE-1 ELectronic Editor Unit

data so that the precise location of the editing point can be clearly identified. This function enables the playback sound to be heard exactly as it would be according to the direction and speed of the tape transport selected.

Internal cross-fade circuits of the XE-1 enable simple key-in selection of any length of cross-fade, from 5 to 100 milliseconds in 5-millisecond steps. This is the digital equivalent of oblique-cut tape splicing — an analog technique that is not applicable to PCM tape splicing.

MITSUBISHI ELECTRONIC SALES AMERICA, INC.
7045 N. RIDGEWAY AVENUE
LINCOLNWOOD, IL 60645
(312) 982-9282

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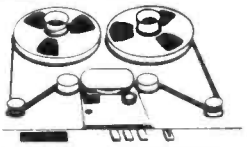

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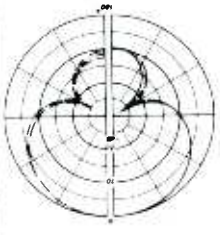

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views

— continued from page 30 . . .

IEEE — 488 Bus . . . *Richard Factor*

also send, in response to the "W" command, "MAIN=100,DLYONLY=393," or whatever the actual settings happen to be. Likewise software routines read and interpret the rapidly changing binary data coming from the pitch ratio readout counter chip and turn that into a pitch ratio.

Data For Man And Machine

The format for sending the data was carefully selected based on two criteria:

1) It should be *humanly readable*, so that with no prior knowledge of the unit, one could determine the front panel settings simply by looking at the data itself, without any form of translation.

2) It should be *machine readable* so that the computer could act on the data and reproduce it.

Of course, any data sent is, by definition, "machine readable," but in this case it is desirable for the computer to extract the essential data without searching for it. For this reason,we put most of the numerical data in fixed character positions. If the computer wants to know the main output delay it knows to look in character positions 6 through 8. And, of course, once the computer can read the data, it can generate commands to recreate the settings at any time. To bring this down to earth: during the mix, the engineer can run the devices being controlled as he normally would. In a later mix, the computer can duplicate the engineer's settings.

The remote control adds one other interesting capability to the H949: it enables the delay of either output to be set in increments of approximately 25 microsec., instead of the approximately 6 millisec. steps available on the standard unit. The original delay setting capabilities are a compromise between usability and front-panel space. Since the major function requiring tiny delay steps is flanging, and since this function is already one of the unit's modes, we decided that extremely fine delay setting wasn't worth the extra cost. However, since there is essentially no extra cost in controlling delay remotely, the remote-control interface accepts delay commands down to the nearest 10 microsec. The microprocessor then "normalizes" this decimal delay request to the nearest available delay step — nominally within 15 microsec. of the delay requested. This allows the H949 to perform effects such as tunnelling, which involves feedback and a delay sweep through zero delay, and more versatile flanging in which the precise pre-delay and delay deviation may be externally defined and controlled.

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The Controller

In the above discussion, we used a phrase "the computer" many times, signifying the bus controller. We assume tacitly that this could be either a standard computer or some manufacturer's automation controlled with an IEEE-488 option. It fact, at the time of writing the initial article, there was little choice of controller. One could either use a Commodore PET computer, or one of the Hewlett-Packard desktop computers at a much higher price. At the time, Harrison was the only console manufacturer supporting IEEE-488, with Allison promising to do so. Things are more promising now. MCI and Neve — and probably others in the audio field — are seriously considering IEEE-488 (or so I'm told), and many more low-priced computers are available.

In addition to the PET, there are IEEE-488 controllers available for the Apple Computer, the Radio Shack TRS-80 (in several versions), the Atari, and probably others including some of the Japanese personal computers soon to appear. Also encouraging is Hewlett-Packard's entry into the low-cost area with the HP-85. We use this machine for much of our in-house IEEE-488 equipment development, as it has an extremely good set of commands and bus instructions, unlike the others which were implemented either haphazardly (like the PET), or as afterthoughts (most of the others).

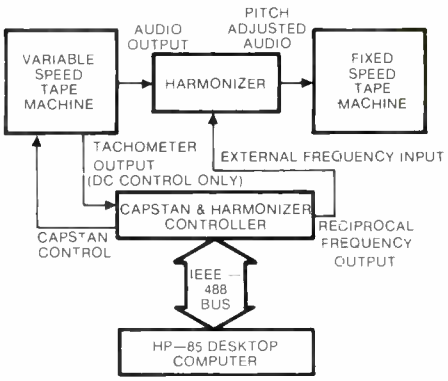
The H-P computer, like the PET, has a built-in timer accurate to seconds per day, and so can be used by itself as an automation controller for IEEE-488 and compatible equipment. The HP-85 has a high-speed internal tape cartridge and 32-character-wide printer. This cartridge can be used to reliably store equipment setting parameters for later use. Even without a console having IEEE-488 capability, an H-P, PET, or other computer can be used effectively to automate the parts of a mix that the console can't handle.

I wish I could say that all major console manufacturers will be sure to have IEEE-488 interfaces available, but except for the few mentioned above, I have no information at all. And the latter two I did mention are just thinking about it. If any console manufacturers are reading this, Eventide (and, I'm sure *R-e/p*) would be pleased to hear about your plans in this area. And, if you need any information or suggestions on software compatibility, we will be happy to cooperate.

New Bus-Controlled Instruments

At the November 1980 Audio Engineering Society Convention in New York, Eventide had on display two new units, each of which used the IEEE-488 bus in a different way. The first item was basically a dual-frequency synthesizer. This boring-looking device appears to the user as a black front panel with a power on/off switch and an LED. It is perhaps the first unit designed for the pro-audio market that performs a wide variety of functions, and has (excluding the on/off switch) absolutely *no controls!*

This device is designed expressly for computer control, and is used in conjunction with the H949 Harmonizer to allow broadcasters and others to change the playing time of recorded material. Normally, this may be accomplished with the Harmonizer alone, since it has a capstan drive output on the back. However, for reasons of economy, it was impossible to make the H949 compatible with every possible tape-speed control scheme. And, because the unit's pitch control is basically



A diagram of how a computer in conjunction with our IEEE-488 interfaced frequency synthesizer and a Harmonizer can alter the playing time of a recorded program. Although it is not shown on the diagram, an IEEE-488 bus could also go to the Harmonizer to set mode of operation, thus eliminating the few remaining manual steps. The capstan and Harmonizer Controller can generate and measure DC voltages under computer control. This allows it to generate the proper control signals for almost any tape recorder, including those whose interface characteristics are not yet defined.

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an analog system, getting pitch ratios accurate to better than 0.5% is a bit tricky. This is fine if you want to shorten a 62-sec. commercial to 58-sec. But what if you want to change a program from 1 hour to 59 minutes and 50 seconds? Obviously more accuracy is needed.

One solution would be to build a complete computer/frequency synthesizer arrangement with the capability to compute and generate the precise control frequencies necessary to accomplish the speed change. A far less expensive and potentially more versatile solution involes making only the special-purpose hardware necessary to control the Harmonizer and tape recorder(s). This device could be controlled by any of the low-cost IEEE-488 computers on the market, and the computer could do the specialized computation necessary to control the "black box." Using such a combination, it is possible to simultaneously and independently control pitch and speed, and even have the computer perform the timing functions and control the tape recorder start and stop. And if a new tape recorder comes out using a non-standard control frequency or voltage, one can simply enter this data in a program to compute offset voltages and frequencies.

Two advantages accruing from this approach include the availability to the user of a real computer when he's not busy changing program lengths; and the capability of re-programming the system in a high-level language (usually Basic) much faster and with lower cost and risk than if only machine-code or assembly language were available. This assures that the general-purpose nature of the system is available to the end user.

Dynamic Reconfiguration Of Peripherals

Another example of the value and versatility of the bus is embodied in our other new product, the SP2016 Digital Signal Processor. Shown in prototype form at the New York AES, this device is a general purpose "audio computer," which digitizes the input signal and allows one to do an almost infinite variety of operations on the signal, before re-converting it to the analog domain. Special applications of such devices include generation of echo and reverb, creation of digital filters (EQ), along with such common effects as delay and flanging. The general purpose nature of its architecture also permits the end-user to program his own digital effects if he wants to experiment with the unusual possibilities of digital signal-processing.

However, in both development and use of such a product, a serious problem arises. How can we, the manufacturer, rapidly and efficiently develop programs that ultimately will be stored in read-only memory (ROM) when delivered to the customer. And how can the customer develop his own program when there is no familiar terminal or keyboard by which to enter instructions? Of course, one solution would be to provide a terminal, and thereby increase the development cost and the end-user cost by a large percentage.

A far better solution is (have you guessed yet?) the IEEE-488 interface! By allowing the SP2016 to communicate with an external computer, one need only write a short and inexpensive "monitor" program to allow data entry. Then an external computer with a much more versatile language structure can "download" instructions to the digital signal-processor. In addition to the advantages in programming — both at the factory and at the studio — this approach allows an indefinite number of programs to be stored external to the processor, and then loaded into its memory on demand. Instead of being restricted to factory supplied ROMs, the owner can have a large number of specialized effects and processes stored on a tape ready for use at a moments notice. Without a high-speed interface bus, loading these programs might take several minutes each, making it effectively impossible to conveniently re-configure the unit. And without *any* interface bus at all, the manufacturing cost would increase and the user utility decrease.

Bus Extenders

Before ending, I'd like to say a few words about bus extenders. The nominal maximum length of an IEEE-488 system is approximately 60 feet, which is fine for a control room but bad for an auditorium. Enter the extender. Hewlett-Packard manufactures a device called the 37203A HP-IB Extender. (Catchy name, huh?) A pair of these devices can be connected by a fiber-optic cable up to 3,000 feet in length; plugging a controller into one end and instruments to be controlled into another allows the IEEE-488 bus to be extended to the full length of the fiber-optic cable.

To leave room for the imagination, I will describe only one application: A performer has an effects unit in his on-stage rack. During the performance, he likes to vary the pitch using a foot pedal. He would also like to be able to vary the controls in other ways, but cannot because he's busy performing. Meanwhile you, the band's soundman, use that same device for a complicated special effect at a specific time in the performance. For example, you might want to capture the last phrase of a song in repeat and sweep the pitch in reverse just as the song is ending. This is tricky to do at best, even with the unit at your side. How to do it with the unit located on stage? And how to then let the performer use the unit himself for the rest of the performance?

Recipe: Harmonizer, bus extender, and computer. And, if it sounds like it may be easier to simply get another H949, remember that the same computer and bus extender can simultaneously control up to 14 local and 14 remote devices as well! Oh yes, one more point. The fiber-optic connection between the units absolutely and unconditionally prevents ground loops and hum pickup on the ½-mile fiber-optic connecting link. That alone may be worth the price of admission.

Well, there you have it. What more can I say? We need a standard. There exists a perfectly adequate one. It is electrically desirable and politically acceptable. Eventide has, *de facto*, adopted it. If a few more manufacturers adopt it, it may become *de jure*. □□□

views

THE WORLD OF DEMO RECORDING: *the monster that ate Boston*

by Paul D. Lehrman

Over the past few years the city of Boston, along with the surrounding New England states, has gained a reputation as being fertile ground for rock bands. Recording artists like the J. Geils Band, Cars, Boston, and Aerosmith represent the tip of a musical iceberg, while quite a few other bands, including the Fools, Private Lightning, and Robin Lane and the Chartbusters, have achieved national recognition and recording contracts within the last year or so. The New England area has also been an important breeding ground for folk and blues artists; Bonnie Raitt, Noel Paul Stookey, Tom Rush, Arlo Guthrie, Jonathan Edwards, James Taylor and his extended family have all called the region home at one time or another.

As with most major cities in the USA, local record labels abound, and nearly every studio of any status in New England has its own vehicle for releasing the products of talent it draws through its doors. Other well-respected labels originate in the area, such as Rounder and Titanic, which are geared towards specialized markets but distributed nationally.

The number of recording studios within the six states that make up New England has grown in the last three years from about 40 to over 65. That number includes only those studios having at least eight-track capability; it does not count the dozens of private studios, nor some very respectable four- and two-track rooms. These larger studios range from TEAC/Tascam garage facilities to automated 24-track houses, some boasting such luxuries as acoustic echo chambers, concert grand pianos, or large collections of rare microphones. There is also an active video community, ranging in sophistication from portable VHS systems to two-inch Ampex video recorders with SMPTE capability.

Given the huge amount of lower-echelon musical and recording activity, it's no surprise that Boston has also come to be known as "Demo City." Indeed, some of the smaller studios glorify that distinction in their very names. There are those producers and studio owners in the area, however, who resent that appellation. They feel that the "demo" tag makes it difficult for major record labels to take Boston-based product seriously, or that it generates an undeserved image of the town as a thriving hotbed of mediocre music. There is no doubt, though, that with the plethora of personnel coming out of the many music schools and high-tech corporations, and the wealth of astonishingly low-priced facilities, an awful lot of demo tapes are produced within the area.

What constitutes a demo tape? How, if at all, does it differ from a recording destined for release on vinyl? How can a studio or independent producer attract demo dollars and prepare for and deal with the unique — and sometimes painful — problems that demo recording presents? For help in

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answering these questions, I talked to three people from the Boston area who work actively in both the demo and master recording fields; their comments, however, are applicable to most areas of the USA. All three started their careers in New York, but have been based in Boston for most of their ten or more year's active involvement within the recording business.

Karen Kane, 29, is now a free-lance engineer, but has served on thestaff of Studios in Boston (Intermedia) and New York (Six West and Premier Sound); she was also one of the first independents to gain a foothold in the New England area. Although Karen works primarily out of two studios — Sound Techniques, and 8/16 track facility based in Watertown, Massachusetts, and Soundtrack, a 24-track Boston studio — she has spent time in most of the major rooms in the locality. While she rarely takes on the role of producer, Karen will often co-produce a band she is recording.

David Butler, 30, was chief engineer at one of the first 24-track facilities in Massachusetts, before striking out on his own a little over two years ago. He runs a production company, O.T.L. (Out to Lunch) Productions, and is involved with many other areas of the electronics world. For most projects in which he becomes involved, David acts as both producer and engineer.

Jay Mandel, 27, is owner of Triton Productions, which comprises a production company, record label, Titanium (a research and design facility), and a 16-track recording studio that boasts one of the finest collections of tube microphones on the East Coast — as well as some rare Teletronix and Fairchild tube limiters. Jay cut his technical teeth doing live radio concerts for New York's WBAI, and since then has been responsible for recording and producing some of the New England area's most successful acts. Although he no longer personally handles one-shot business —preferring instead to work with promising bands in long-term production agreements — his studio and staff are still active in the demo market.

So What Is A Demo, Anyway?

Actually there are several types of demos, and it's important to distinguish between them. Tapes may be made for sending to club owners, publishing and record companies, or they may be recorded for special purposes; for example, punk renditions of Christmas carols destined for a few weeks of radio play, and subsequent oblivion.

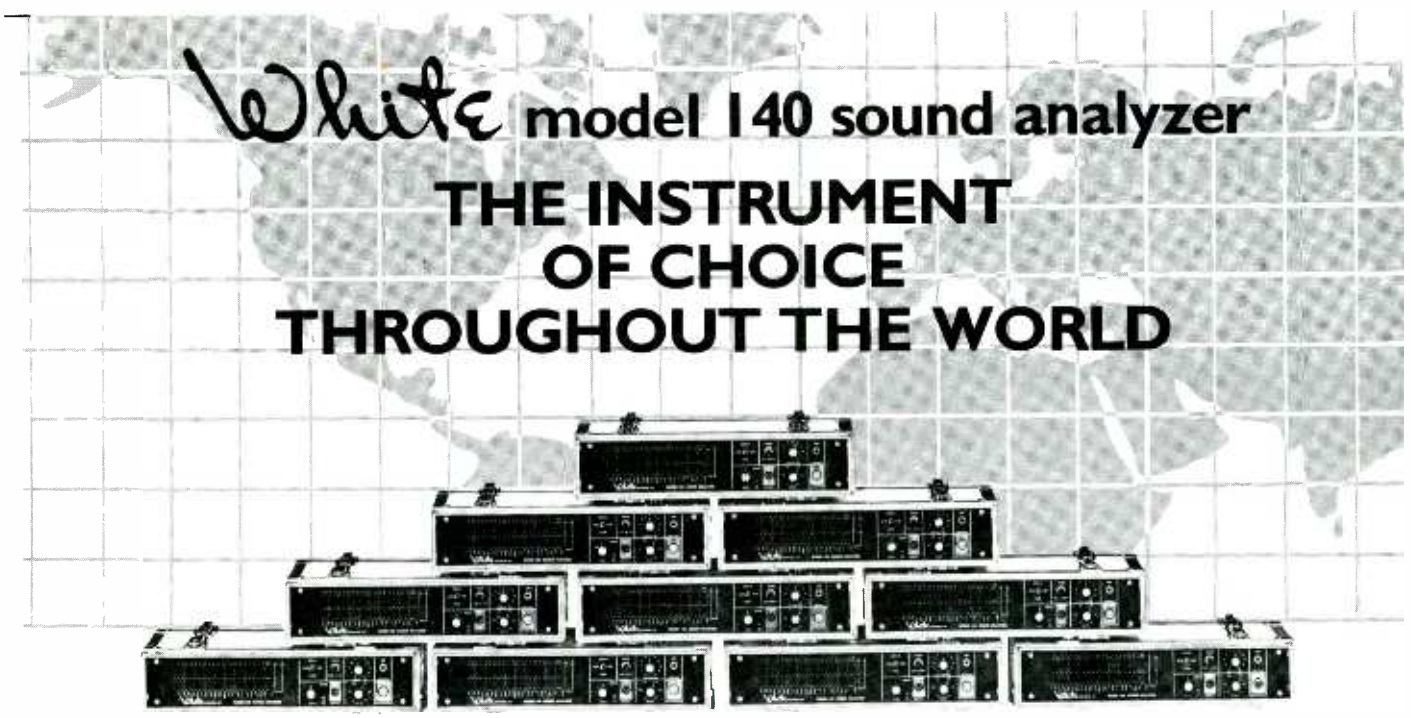
Song publisher demos are the easiest both to define and to produce. Their purpose is to present the material of an artist — who may not consider themselves primarily as a performer — to potential publishers, or else to fulfill contractual obligations on the part of an already-published songwriter.

"Publishing companies these days seem to prefer tapes to lead sheets," David Butler says. "Otherwise they have to go into their own facilities, or buy time and get other people to perform the songs, so that they can then sell them to their clients. I've found that publishers would either like to be presented with a finished master, or just a piano/vocal tape. The stuff in between gets them really ticked off, because you're clouding the issue as to what's going to happen with the tune. Maybe you think it's a rock killer, but they hear Dolly Parton doing it; if you throw a fuzz guitar into the middle of it, it'll wreck their perception. If a tune depends upon a groove supporting it, then I'll bring in a rhythm section, but if the piano or guitar is enough to get it across, then that's the way to go."

"Sometimes," adds Karen Kane, "the material is so strong that just a little production can really enhance it. But that depends mostly on the type of song it is. One guy made a tape of eight songs to send to Anne Murray. With that kind of showey music, you can hear if the song is there with just piano and vocal."

According to David Butler, demos for club owners have a limit on their usefulness. "At best, they can help a band a little by increasing their local exposure. If they have a single out, and especially if they're getting airplay, then they can command a much better rate from the clubs."

Karen Kane, however, is a little more optimistic. "Of course tapes are worthwhile," she claims. "They should, however, be done as live as possible. You don't do a thousand overdubs, or cook up all sorts of production



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(continued)

things that the band or artist can't possibly do on stage. You do overdub the vocals, and maybe clean up a guitar solo here or there, but the sound should be raw. Doing a recording like that in a studio is better than telling the band to record themselves at a gig — the sound will be clearer, the performances will be cleaner, and people will be impressed that the band has taken the trouble to go into a studio and prepare a good tape."

But most demo recordings are done with record deals in mind, and the principles involved are not nearly so cut and dried. All too often, the dominant factors for determining the production values of a demo tape are nothing more complex than the amount and source of the money.

Where The Money Comes From — And Goes

Most often, bands and artists will finance their recording from the dollars they earn playing live gigs. As David Butler notes: "If they're not paying for it themselves, then often it's somebody's rich mommy or daddy. Particularly if they're not planning on releasing it, no serious investor is going to put a lot of money into something that's only going to end up as a tape."

Karen Kane disagrees, however: "I've seen situations where the backer is just a friend who has money, and is interested in the music. One guy I know recorded this way, and although the backer hasn't recouped his investment yet, he was thrilled by the result. There really are people like that."

If a band is tight, a decent two-song demo, using eight hours to record and another eight to mix, can be made for around $300. In most cities, ½-inch 8-track time at a number of fairly good studios can be had for $15 an hour, including an engineer. In the incredibly competitive demo-studio market, new studios periodically open up trumpeting $12.50 per hour rates. But after such places get through the initial shakedown period, begin to iron out their technical and personnel bugs and establish a reputation, invariably the rate increases.

Twenty-four track time could be considered even more of a bargain. While few studios in Boston — as with most large metropolitan areas — advertise a "book" rate of less than $60 to $80 per hour, "night-owl specials" are rampant; occasional daytime sessions are even available for as little as $30 an hour. In an effort to upgrade the demo scene, and conceivably to get bands addicted to the freedom and professionalism of 24-track recording, some studios even offer to lend, at no charge, a roll of two-inch tape for a demo session, thereby bringing down the cost of that same 16-hour project to as low as $500.

Whether studios can afford to maintain practices like this for long is a matter for conjecture. Although it is on the upswing, the amount of label work going on in Boston, for example, is still relatively small, and clearly it would be impossible for any state-of-the-art facility to survive on $30 per hour clients in a city where the temperature stays below the freezing mark for four months at a time, and real estate prices are climbing with a bullet. There are plenty of casualties. Nevertheless, there are ways to deal with the demo market, and survive. One of the more successful studios pays its bills by reserving the daytime hours for advertising clients, who pay the book rate, and selling the nights, when ad agencies and unions make it expensive to work, to local bands at discount rates.

Other techniques that have allowed studios to prosper include block-booking generally unused hours as far in advance as possible; recruiting local independent engineering and production talent to act as sales personnel — by offering them commissions on top of an hourly rate; and clearly delineating the different rate structures for master recording, and for self-produced demo masters.

Connecting With The Client

Studios and free-lancers that become involved with recording an act for the first time must exercise some discretion in choosing clients. A particularly rowdy band may not be welcome in a facility which, the next day, has to host a major label or advertising session. But it's not too difficult, especially with a little experience, to screen out those potential clients who might cause trouble — drinks spilled on the board, for example, or people sitting on tape machines — or make things difficult in other ways.

Possibly worse than physical damage to a recording facility is the damage a really lousy act can do to an engineer's attitude and, subsequently, to his or her reputation, or the reputation of the studio.

"When I was first getting my name around," recalls Karen Kane, "anyone who called me could have me, but I ended up working too many sessions where people were weird and their music was no good, and I got very uncomfortable. One of my biggest assets in the studio is my attitude; if I start to feel crummy, if I get tense and bitchy, then I just don't want to be there. I've learned to become very perceptive on the phone, and if I'm talking to someone who I don't think will work out, I just tell him I'm booked."

David Butler's criteria for taking on a particular project are even stricter: "In my 'turkey shoot' days — when I would just line up all the turkeys who would pay me and knock them all off as fast as possible — I would take anything that came my way. Now I have to decide that it's worthwhile before I'll get involved, and that there is material there that can be prepared for release. At this point, 80% of what I do is released in some form; 20% of it on a national basis. Rather than take on all of that bad business, I make extra money doing tech work — design, maintenance — so at least I can look myself in the eye when I wake up in the morning and tell myself, 'Yeah, you earned your paycheck this week!' "

Being selective about clients can help a studio avoid the bad-mouthing that invariably follows a session that was unproductive, or that degenerated into squabbling or chaos. Most bands are in close touch with many others, and a bad word on the street about a studio can quickly lead to a general shunning of the facility, both by bands with talent and those without.

Connecting With The Studio

For the independent engineer or producer who has been contracted by a band to do a demo recording, choosing a studio can be a difficult task. Again, money is the strongest factor, but several studios should be available that fit into just about any particular budget category. Some artists, whether as a result of knowledge or fantasy, insist that a studio have a certain piece of equipment.

As David Butler recalls, "I was doing one session with my scope, which I like to use to check phasing and stereo spread. Another band followed me into the studio, accompanied by, as it happened, one of my proteges. When I left, I took the scope with me. The band got very upset at their engineer because he didn't have one. They thought that that was what made it sound 'professional.'" An engineer has to weigh such requests carefully, and sometimes explain an unpopular decision to his skeptical clients.

Karen Kane has her own ideas about how to choose a studio: "More than anything else, I look at the people working at the studio. I will only give business to a studio that is run by people that I like or believe in. No matter how good the place may be technically, I don't want to have to tell people on the staff to leave the control room because I can't stand them. I will only go where I feel respected and comfortable.

"After that, I'll look at the financial arrangements. Some studios, like the two in which I do most of my work, will charge the client a rate and pay me. In other places, I become the studio's client, and I have to deal with my client separately. So I have to take into account how difficult it's going to be to work out how I get paid. As far as equipment is concerned, if the room has good basic stuff, I can do tracks there. Mixing is another story, but I can get a good sound for basics just about anywhere."

Long-Term Agreements And Written Contracts

One of the thornier problems of working with an act for the first time involves detailing the engineer/producer's duties and compensation, and deciding whether or not to get involved with the act on a long-term basis. Sometimes this involves the drafting of a 20-page legal document, sometimes a brief letter of agreement, and sometimes a simple discussion and handshake are sufficient. Obviously the complexity of any agreement bears a relationship to the scope of the project, but our three respondents display three very different attitudes.

Jay Mandel: "Working with an act in some form of long-term relationship is the best way to allow a producer to gain insight into the artistic and marketing potential of the band, as well as its long-term goals. Otherwise you can get involved in a fairly sadistic experience where you end up having to watch a group of people confronting a situation they are not all prepared for. If an act looks promising

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us, we prefer to sign long-range legal agreements.

"It's true that an artist may spin 180 degrees and vanish when confronted with a contractual listing of obligations. But from a professional standpoint, any producer that places a high value on his work understands that, without the contractual specification, the result will likely not be in line with his initial goals. The aggravation and expense of utilizing proper contracts is decidedly less than the expense of litigation, which is often the result of not taking the right steps at the outset."

David Butler: "If it looks like a group has some potential beyond what they see as the immediate goal, I'll try to push them towards something more serious. Of course, if that's out of line with their finances, or if they're not interested, I may take them on anyway, because I have this funny habit of liking to eat.

"I do always try to pass some paper, but I've begun to avoid getting into heavy detailed contracts. If the basics are written down, it makes the whole relationship much more positive and less confusing. I've seen cases where trying to get everything on paper has blown the whole deal, and the very least that happens is that the group loses inertia. People get scared by phrases that are totally conventional to lawyers, but unfamiliar to them; pretty soon they go out and talk to another studio, because they'll take them on nothing more than a letter of agreement.

"I draw up very simple agreements — who's responsible for what and who's entitled to what — and have yet to find anyone trying to make end runs around me. I also leave people an out, either by limiting how much I make, or by including a buy-out provision. I try to stay in for a percentage, because that's how money is made in the long run, but I'll never write a contract that will prevent a group from making a deal because some record company objects to throwing 2% in somebody's direction."

Karen Kane: "I don't do spec deals; I don't own the studios, so I have to pay somebody something, anyway. If there's a project I really believe in, I might ask the studio to get involved, but it's never worked out. My long-term agreements, when I have them, are all verbal. Bands have told me, 'If we get signed for an album, we'll take you with us.' That may mean I end up as second engineer. Sometimes I believe them, sometimes I don't. The fact that it was stated, and that the desire is there, is okay for me; I enjoy the compliment. One producer I work with, who handles a lot of bands, will work with no one but me. I *know* this is true — I don't need contracts with him. If things ever get to a crucial point, I suppose I will have to pass paper, but I haven't had any trouble up to now."

The Producer/Engineer's Role

Whether or not there is an agreement on paper, if the recording sessions on a demo project are not going to turn into shouting matches, the role of the engineer or producer must be clearly defined. At the same time, the goals of the project must be completely understood by all concerned, and the decision of how much production work is going to be involved must be made.

The producer/engineer's role may be anything from simple technical functionary to arranger, manager, babysitter, handclapper, or even backup vocalist or instrumentalist. What's often more important, however, is to make the band aware that miracle worker is not on the list of qualifications for most engineers.

"As the industry has grown," Jay Mandel observes, "the studio has taken on a rather overblown mystique of being *the* source of success. You can, of course, negate the impact of talent by poor technical performance, but that's less common than might be imagined. The process begins and ends with talent, with the interface — meaning the studio and the technology — playing a relatively minor part."

"An engineer or producer can be a mitigating force," David Butler says, "in that he can make the whole a little better than the sum of the parts through careful editing, emphasizing strong performances, or burying or erasing weak ones. But at least you're talking about bringing things to their average point, or possibly a step higher than that. If there isn't much talent there, and you try to make a big production effort, it will just lay wide open the fact that there is a lack of talent, and they'll blame it on you. You have to be very careful in deciding how much control to take."

— *continued overleaf* . . .

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(continued)

Karen Kane finds that "most bands I work with are producing themselves, and it's usually obvious who is the one person more-or-less in charge. If it's not clear cut, I'll make the effort to talk to the songwriter. The hardest way is to try to work with everyone at the same time. Then I become co-producer with the band. None of this is spoken, it just works out that way. If I feel that they will take on something I say, I will suggest things. If not, I will back off; I know when to shut up!"

David Butler agrees: "I try as early as possible to get good communication with one or more people in the group. It's something I learned years ago working with Phil Ramone. I try not to dictate, but to gently steer people without letting them feel like they've got a whip over their heads. It's important not to let things get too democratic. I've seen only one or two acts over the last ten years with enough collective consciousness to be able to work that way."

Getting To Know The Clients

Part of the process of learning about an act's recording goals might be going to a band's rehearsals or live gigs.

"I wish more people would do that," says David Butler, "and bring their cassette machines. All too often I'll go to a rehearsal and feel that we've come out with a coherent arrangement. Then when we're in the studio it's, 'Oh, I thought you went into that bass lick in the third verse, not the second.'

"I think, too, that people lose sight of what a band can do out when they're locked away in the ivory towers that some recording centers have become. A few years back, I saw an Icelandic group come into a studio here and do a really incredible album, with some great horn players and synthesizer players laying tracks. But when they went back to Iceland, they couldn't possibly reproduce that material on stage. We had no idea what their magnetic and visual strengths were, because we had never seen them perform live. We ended up taking them from being the top recording act in the country and wiping them out."

Karne Kane looks at it differently: "Usually just a talk on the phone will set things up for me. We'll discuss the instrumentation and the type of sound — whether they want it 'live' or close-miked, for instance — and everything that has to be done, from start to finish. Even for an inexperienced band, it's rare that I go to a rehearsal. More often a couple of the guys will come over and bring a homemade tape. If they haven't already, I will always suggest to them that they do a tape at home; on cassette, four-track, or whatever they have."

Pre-Production

Although it's often a luxury for the beginning band, there is universal agreement among engineers and producers that some kind of pre-production can be of tremendous help. Some producers like to take a new band into the studio and record it, with no frills or fanfare, right on to two-track. Such sessions give the artists a feel for studio recording and working with the engineer; they also allow the engineer to hear the material in a controlled environment.

"That kind of pre-production is probably the most useful vehicle for a producer to gain perspective on a project," says Jay Mandel. "For most artists, it represents the first time they've heard the song outside of a rehearsal or performance situation. It lets you look at song development and arrangements in a manner that's precise, with as few variables as possible."

"When I see a group live," offers David Butler, "one tune in particular may strike me as being hot. But if I have a two-track reel at home, or a cassette, I can ride around with it in my car, then frequently a dark-horse candidate will appear."

Pre-production also makes it easier for the engineer to talk about the technical problems of recording, and to explain the equipment and processes that a band might be exposed to for the first time.

"I don't want anyone spending a lot of money in the studio who is ignorant of the recording process," Karen Kane says. "Sometimes I'll even have to sit down with them and literally draw pictures of track layouts and signal paths."

The Session — First Hurdles

Okay; paper have or have not been passed, arrangements settled upon, a schedule for recording and mixing drawn up, and tape is rolling. Anyone who has ever recorded demo sessions knows that the headaches have just begun. Very often, the first problems that show up during track-laying are with the band's own instruments.

"Bad instruments drive me crazy," moans Karen Kane. "Although it is rare that I work with bands that don't have good working equipment, there have been times when people, particularly if they're poor, will show up at the studio with junk. From my experience, I can take the shittiest drum set in the world and make it sound decent. But when you have a guitar that won't stay in tune, or the neck is off, or has noisy pots, then you simply cannot do that track. I will stop the session and say, 'This is a waste of time. Come back with a good instrument and we can go on.' I make it a point to tell a band to be sure their instruments are in the best possible condition before they come in."

Karen's self-confidence notwithstanding, drums often present the biggest problem, since few drummers who have never recorded realize the difference between a good live sound, and one that is suitable for close-miking. Often an engineer must painstakingly explain how to make drums sound good on tape, and will occasionally have to tune and mute the drums himself, over the howling objections of the drummer.

Rented instruments can be a problem, too, even if they are in perfectly good shape. This writer engineered a session for which the band had rented a string synthesizer of a type they had never used before. We had no trouble getting the proper sound out of the thing, but as it began to warm up, the pitch started to rise. No one could find any adjustment for tuning, so we simply kept speeding up the tape on each take, to match the instrument. As we were packing it away, the bass player, who had been paying no attention the entire session, pointed out a small, unmarked screw pot, which turned out to be the pitch control!

Often the answer is to use in-house instruments. Any studio will have, or can get, basic keyboards, but the need for a well-set up drum set and reliable guitars and basses also exists. Considering that so many of the smaller Boston studios are owned by musicians, it's surprising that few of them have good collections of house instruments. Some studios feel that they are an unnecessary expense.

"The artist who is well-versed in his craft has a reason for using the instrument that he has," Jay Mandel maintains. "It really doesn't make sense for a studio to orient itself towards providing a unversal set of instruments, because that is something that the conscientious artist is obligated to decide for himself."

In the real world, however, and esepcially in the world of demos, musicians are often not so conscientious. But there's another reason that house instruments are not popular, and that is because they have a bad reputation with many in the business.

"I think that's because of the way most of them are maintained," says David Butler. "Staff have to be prepared to take care of all the instruments, just as they do the tape machines. You wouldn't expect someone to play your piano if it hadn't been tuned in six months. It's the same thing for other instruments — keep them in tune and with fresh heads and strings."

Hearing Themselves

Inexperienced bands invariably have trouble dealing with the realities of cue feeds and studio monitoring. Many have heard of studios or live performances where every member of the band has his own cue mix, and are then upset when confronted with the fact that few demo-oriented studios have more than one, or at most two, foldback circuits, and that the headphones may not be all that accurate.

"I have to explain," says David Butler, "that the main purpose of studio headphones is to survive through many, many sessions of people abusing them, and that they don't really reflect what's going down on tape. I use that line even when a studio has great cue feeds and Beyer phones, because obviously a headphone mix is a compromise — one or two mixes that everyone is going to have to live and work with.

Probably a little more complex is convincing the band that, likewise, a monitor mix bears scant resemblance to a final mix.

"If they come in and tell me they want more bottom end," Karen Kane says, "I tell them that in this particular room you cannot equalize the monitor mix, but that we can do all that fancy stuff in the mix. I'll agree with them, but I'll be pretty vague, because I know that everything will change by the time we get to mixing it."

A band's first hearing of itself in the studio can be an enlightening and sometimes devastating experience. As David Butler

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recalls: "I've heard comments from bands like, 'I've never heard you play that lick before,' and then the other guy turns around and says, 'That's funny, I've been playing it every night for the past three years!'"

Often, when things sound different from what the band is used to hearing, they will scream, "What have you done to us?", at the hapless engineer. It becomes a kid-gloves situation, and the reaction of the engineer may well determine whether the sessions continues or whether the band will ever record again. A band may be used to depending on its live-sound mixer who, for better or worse, is often responsible for providing the band with what they think is their sound. Consultation with that person (who is frequently present on a session anyway) may be in order, and further polite explanation of the differences between live performance and recording may, of necessity, soak up a few hours.

When The Bucks Stop

Every engineer who has ever tested the waters of the demo business has experienced that panicky moment when the time and money are just about exhausted, and the synthesizer player is still working on his seventeenth overdub. Invariably, there is another session due in soon, and a quick calculation reveals that there will be approximately 6½ minutes to mix each song. Not the least common solution to the problem involves the engineer throwing up his hands and making a quick escape. With care, however, the problem can be avoided; when it can't, there are alternative ways to deal with it that will not destroy the relationship with the client.

As David Butler finds, "Since I'm always careful about communicating with one or two guys in the band from the outset, I can take them aside when the session begins to go astray, and explain to them — without making it a humiliating experience — what their options are. They can scrap the rest of the overdubs and start mixing now, for example, or they can go back on the road for a couple of weeks and come back with enough dollars to at least finish the level of the thing that they're attempting."

Mixing And Finishing Up

Selling a demo tape is a bit beyond the scope of this article, but its eventual destination can have a bearing on how it is mixed. There is often an attitude on the part of the band to let things go by because "It's only a demo." However, it's very dangerous for an engineer or produer to adopt that line, too.

"Going in with that attitude is one of the best way I know for a band to piss money away," says David Butler. "I'm really trying to remove the term 'demo tape' from the recording vernacular. But once we've gotten past all my objections and I still have to call the frigging thing a 'demo,' I have to realize that it comes down to a matter of how much time I have. I'm a staunch perfectionist, and I love to sit there and spend hours and dollars mixing until everything is letter perfect, but sometimes that's just not workable. In that kind of situation, if I know that it's not going to be pressed in vinyl and repeatedly aired in multiple markets, then I might be willing to let more things go by in the mix."

"I once read a story about Roy Thomas Baker," recalls Karen Kane, "that said that when he listens to a demo, Roy plays it on a little JVC cassette recorder that he hangs next to his shower in the morning. If a song can cut through that, then he goes for it. I want to make sure that any tape I do sounds wonderful on a little speaker. When I'm examining individual tracks, I'll listen on the big speakers, and I'll sometimes refer to a set of JBL 4311s to make sure everything's not too bright. But all of my mixing and balancing is done on Auratones. That's not a 'trick' that I use when they tell me the tape is going to somebody or other, however; it's something I do all the time. For me there's no difference between a demo and a master."

And so we come to, perhaps, the point of this whole discussion. Unless there is a written agreement with the artist that no half-track copies will leave the studio (and even then, cases have been reported of discs being pressed from cassettes), every session should be treated by the person behind the board as if the results were going to be heard by millions of people. "It's nice to think that you're at a point in life where you can sit around and wait for the next Aerosmith to trot in the door," says David Butler. "But you have to take responsibility in other cases, and deliver a certain standard of technical performance."

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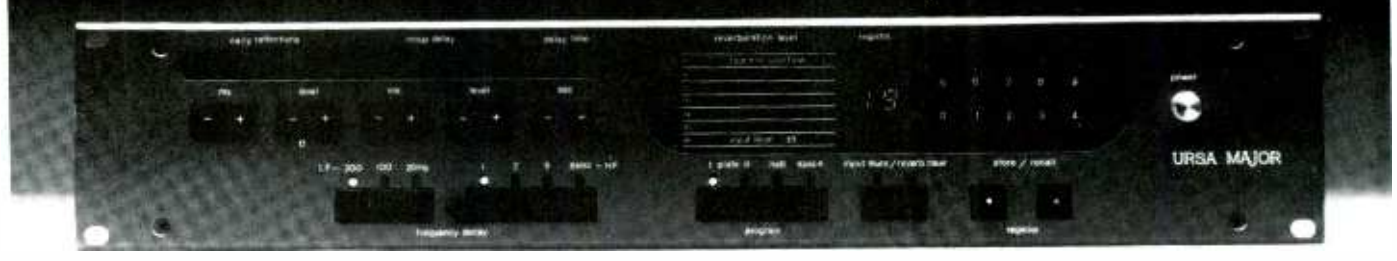

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(concluded)

While successfully maintaining a professional stance in the face of gross adversity may lead, in some people, to what Jay Mandel refers to as "psychic fragmentation" or other types of personal casualties, it cannot but help to draw real talent into your midst. And that, though some of us may forget the fact at times, is what this business is supposed to be all about. □□□

news

— NEWS CORRECTION —

In the NEWS column of the February 1981 issue, the announcement, "Kepex and Gain Brain Reborn" appeared stating that the original Allison Research Kepex and Gain Brain products were in the process of discontinuation. The announcement in the February issue failed to convey that these products were *only* being discontinued as a result of the market acceptance of the second generation line of products: KEPEX II and GAIN BRAIN II.

SOUNDCRAFT ELECTRONICS RELOCATES U.S. HEADQUARTERS

The U.K. based manufacturer of mixing consoles and tape machines, announces the relocation of their U.S. based service and sales facility from Kalamazoo, Michigan to Torrance, California.

Heading the California operation are Ms. Betty Bennett, who previously managed the Kalamazoo office, and Wayne D. Freeman, recently vice-president of New West Audio Marketing and formerly marketing manager of BGW. Shane Morris of the London headquarters will assume the position of Technical Director.

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SMPTE FALL CONFERENCE AND EXHIBIT SCHEDULE SET

The 123rd Technical Conference and Equipment Exhibit of the Society of Motion Picture and Television Engineers will be held **October 25-30, 1981** at the Century Plaza Hotel in Los Angeles, as announced by SMPTE Conference Vice President Charles A. Ahto.

The SMPTE Equipment Exhibit, one of the year's most important shows of professional television and filmmaking equipment, is expected to have more than 300 booths of equipment.

METAL EVAPORATED TAPE KEY TO MATSUSHITA CAMERA/RECORDER MICRO VIDEO SYSTEM

Using Metal Evaporated Magnetic Tape the new system is, said for the first time, to combine a color video camera and video tape recorder into a single unit.

Matsushita's metal evaporated magnetic tape, developed two years ago, has magnetic flux density more than 10 times higher than conventional magnetic tape. This advancement is expected to improve recording capacity, and reduce the size of tape cassette and magnetic recording equipment. The video cassette measures 3.7- by 2.48- by 0.55-inches — a little smaller than an ordinary audio compact cassette.

The newly-developed prototype of the micro video system is almost as small as the current portable video camera, and weighs just over 4½ pounds, including batteries. Tape speed of the system is 14.3 mm per second, the slowest among systems of this kind.

Because of the use of metal evaporated magnetic tape, the system can be used not only for NTSC systems but also PAL and SECAM (which require 20 percent higher recording density) without any major modifications such as enlargement of the diameter of the head cylinder.

The compactness and high performance of the system were also realized by the development of the "Cosvicon" ½-inch color image pick-up tube, the smallest of its kind, and the employment of ICs and LSIs in the circuitry.

Matsushita will cooperate with other companies in order to establish an ideal standard format for micro-video systems as early as possible.

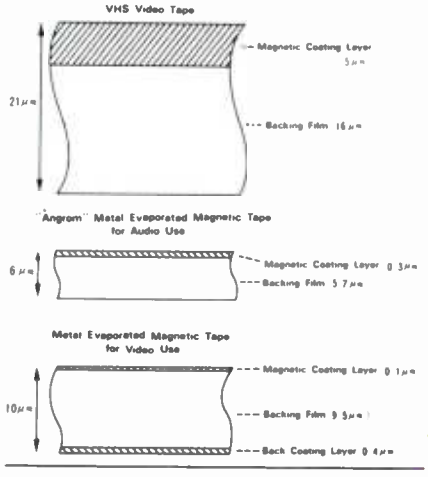
Development of VTRs and Magnetic Tapes: Increased recording density through the improvement of the magnetic properties of tape has been one of the keys in the development of smaller compact VTRs. Initially the first generation of iron oxide magnetic tapes had a coersive force of approximately 300 oersted. In the 1970s, the second generation high-energy tapes with coersive force of approximately 600 oersted helped the development of ¾-inch U-matic and VHS home VTRs. The most recent generation of tapes — an alloy formulation with approximately 1,000 oersted is indispensable to the development of micro-video products.

Having recognized that metal evaporated tape is the most ideal among alloy types, Matsushita has developed the special metal evaporated tape for micro-video use.

Metal Evaporated Magnetic Tape: Conventional magnetic tapes use a coating process in which the plastic backing film is coated with powdered magnetic materials, such as iron oxide and alloy, together with binding resin. In the newly-developed tape production the magnetic materials — nickel and cobalt — are evaporated in a vacuum, and then crystalized on the plastic backing film to form a pure magnetic layer void of any resin. Thus, the magnetic material content in the magnetic layer is almost 100% pure, while conventional tapes average a 30% magnetic content. The magnetic flux density has become more than 10 times higher than conventional magnetic tapes, and the thickness has been reduced.

Matsushita Electric has already marketed this tape for audio micro-cassette tape recording under the °*Angrom* brand name. The °*Angrom* recording tape prolongs a conventional 2-hour recording time to three hours.

Comparison of Tapes



"SCOTTY AWARD" JUDGES NAMED

Five well-known members of the recording industry have been named to the "Scotty" Master Music Maker Award selection panel, announced Dennis Farmer of 3M's Magnetic Audio/Video Products Division, creators of the award. The five are: **Tom Cahill,** Howard Schwartz Recording; **Guy Costa,** Motown Records; **Quincy Jones,** producer; **Glen Snoddy,** Woodland Sound; and **Joe Tarsia,** Sigma Sound.

Each "Scotty" award will honor the team of artist, producer, engineer and studio involved in creating an outstanding recording. In order to qualify for the award, the recording must have achieved gold or platinum status according to the Record Industries Association guidelines. Further, it must have been completely mastered and mixed on Scotch audio recording tape.

The "Scotty" itself is an original sheet music style painting of the artist, personalized to highlight the winning recording. In each case, the artist will get the original painting, while other team members will receive framed, high quality reproductions of the original.

In addition to awarding the "Scotty," 3M will contribute $1,000 to the Muscular Dystrophy Association in the name of the winning team. An additional $100 will be given to MDA in the name of each studio submitting a qualified nomination.

AMERICAN GRAMAPHONE RECORDS BUYS FIRST SONY DIGITAL SYSTEM IN THE MID-WEST

American Gramaphone, the Kansas City based audiophile and direct-to-disk label, has recently purchased a Sony PCM-1600 System, including editing equipment in conjunction with Sound Recorders (Omaha, Nebraska) studios. The company will be recording live to digital and mixing all multitrack projects to a digital master, as well as transferring their complete back catalogue to the digital format.

Don Sears, president of American Gramaphone, explained his reasons for the move to digital: "It's as good as direct-to-disk, and also allows us the production capabilities of layering sound, over-dubbing, editing and complex mixing which cannot be done direct-

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to-disk."

Best known among the label's releases are albums in the *Fresh Aire* series, first introduced in 1974, and currently said to be one of the biggest sellers in the audiophile category.

Future plans at the company call for the purchase of a second Sony unit for the Sound Recorders studios in Kansas City, Missouri, and the creation of a microwave interlock between the two digital studios. Artists will be able to work from either location on the same recording, with directing done via telephone lines.

Dr. Hook's "SEXY EYES," Bob Seger's "AGAINST THE WIND" receive Ampex Golden Reel Awards: *In the photo at left, the Nashville team of (left to right) Jim Cotton, studio manager and chief engineer of* ***The Sound Lab****; Joe Scaife, assistant engineer; Ron Haffkine, Dr. Hook's producer; Jean Roberson, general manager; Pat Holt, assistant engineer, exhibit their awards. At* ***Capitol Records Studios,*** *recording engineer John Arrias (left) and Hollywood studio manager John Krause (right) congratulate each other upon receipt of Golden Reels honoring the Bob Seger/Golden Bullet Band album. Golden Reel awards are made for outstanding albums recorded and mastered on Ampex Grand Master™ pro-audio tape.*

AUDIOTECHNIQUES OPENS CONSIGNMENT EQUIPMENT CENTER IN MANHATTAN

According to manager, Matt Brosious, the Audiotechniques Equipment Exchange is a unique concept in used equipment merchandising. For the first time in the Eastern United States, prospective purchasers of used professional audio equipment will be able to chose from a large selection of products in one centrally located showroom. The Equipment Exchange, located in Manhattan's Brill Building, accepts used recording equipment in good condition for sale on a consignment basis. Sale price of the equipment is determined by the owner, usually after consultation with Exchange personnel.

Purchasers of equipment have the advantage of being able to see a variety of products in every category and are invited to bring their technicians to verify the performance status of items chosen. The same service is available from Audiotechniques technicians, who will do a proof-of-performance checkout for an agreed on fee.

Purchasers and consignors are advised to call the **Audiotechniques Equipment Exchange** at **(800) 223-2486** or **(212) 586-5989**.

SUMMER WORKSHOPS IN DIGITAL SOUND ANNOUNCED

Three one-week workshops in Digital Sound Synthesis and Processing will be offered this summer in Boston. The workshops will provide a hands-on introduction to digital audio technology, and are intended for recording engineers, electronic music composers and performers, and psychoacoustic researchers among others.

The courses will be held August 3rd through 7th, August 10th through 14th, and August 17th through 21st, 1981 in Boston, Mass. The cost is $300 for the one-week session; this includes tuition, studio time and course materials.

Topics to be covered include fundamentals of digital audio, unit generators, automated synthesis and processing, nonlinear techniques, digital delay, filtering and reverberation, digital audio hardware and future trends. Each day of the five-day workshop is said to include a class session, group studio time to work on practical studio

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problems in synthesis and processing, and individual studio time. There is no prerequisite for the course, but some knowledge of analog synthesis techniques or elementary musical acoustics will be helpful.

The courses will be held in Digital Music System's studio, said to be one of the few in the world equipped with a real-time digital audio and synthesis processing system. Leading these workshops will be Dean Wallraff, a former member of the faculty of M.I.T.'s computer music studio and the founder of Digital Music Systems.

DIGITAL MUSIC SYSTEMS, INC.
P.O. BOX 1632
BOSTON, MA 02110
(617) 542-3042

Book Review —

SHERMAN KEENE'S PRACTICAL TECHNIQUE FOR THE RECORDING ENGINEER

A Streamlined Technique for Speed, Accuracy and Documentation

by Sherman Keene
Sherman Keene Publications, 1981,
221 pages, $35.00

It has long been assumed that, due to the sheer bulk of the information to be covered, it would be impossible to produce a comprehensive treatise on recording techniques. However, *Sherman Keene's Practical Technique For The Recording Engineer* comes closer to achieving this goal than any effort to date.

Sherman Keene's professional background is indeed impressive. He has engineered projects at the Record Plant, Los Angeles and New York; Sunwest Recording, Los Angeles; Electric Ladyland, New York; and Wally Heider Recording, Los Angeles. He has performed electronic maintenance work in recording studios, and has designed special recording and live performance equipment. For two years he worked as Frank Zappa's personal sound mixer, recording albums and handling large group sound reinforcement. This often included up to 52 or more inputs into the console, with a separate simultaneous mix for multi-channel recording. He has lectured and taught engineering seminars for the Tamco Company in Japan, for Sherwood Oaks Experimental College, Louola University, the University of Sound Arts, and for the employees of Wally Heider Studios, where he currently conducts on on-going engineering training class. To round out his extensive technical background, Sherman Keene has also been involved in the business from the performing end, having played for two years as the bassist/vocalist for the rock group Spirit, with Randy California and Ed Cassidy.

Practical Technique For The Recording Engineer is a tangible condensation of Sherman Keene's years of studio, technical and musical experience. The book is built as a combination textbook and engineer's manual, and covers all aspects of recording from basic operational procedures to advanced audio systems and theory. As he states in the forward to his book:

"My highest goal is to provide the relevant connections between the reasons and meanings of each concept, and the practical tasks or functions which it supports. By stopping continuously to make connections, I feel that the subject matter is greatly reinforced."

To this end the book has been divided into three sections, each oriented toward a specific level of competency: basic, intermediate, and advanced. Essentially, each section covers the same subject areas, but builds upon concepts discussed in the previous section. As a result, by the end of the advanced section, the reader has a reasonably complete picture of audio theory and studio techniques.

This format allows the novice with virtually no background, other than a healthy interest, to become immediately active in the studio environment and, at the same time, permits the more advanced engineer to utilize the book as a resource manual, by-passing those areas with which he is already acquainted.

The first 61 pages of the book are basic chapters, starting with the best way of laying microphone cables and setting up isolation booths; to abbreviated code symbols for marking control consoles and tape boxes; to basic principles of recording; and finishing with tape handling and storage. The practical information covered in these chapters may also provide useful "hints and kinks" for even the most seasoned engineer.

Pages 63 through 154 encompass the book's intermediate chapters, in which the reader is introduced to the wonderful wide world of acoustics: what sound is; how to control it; what effects the environment has upon it; and how to utilize this information to best advantage. The intermediate chapters also contain some superb information on musical technique, including musical jargon, instruments and voices, the dynamic range of various instruments, and the use of a digital metronome. In a section describing operating procedures, the author presents an extremely clear step-by-step procedure for alignment of tape equipment with and without noise reduction, and provides some excellent and concise information regarding the setting up and use of the Dolby 361 unit. There is also an excellent discussion of practical as well as unusual miking techniques.

The last third of the book concerns itself with the "Advanced Chapters." This section includes tips on the use of isolation booths, problems of extreme acoustic dynamic range, the characteristics of human hearing, and some interesting characteristics of echo and reverberation. This advanced section also deals with the utilization of a variable-speed oscillator (VSO) to alter the speed of studio tape recorders, and practical information on tape-recorder operating levels. One of the high points of the advanced section is the extensive discussion of special effects equipment and techniques, including simple reverb chambers, compressors, limiters, equalizers, tape loops, "tunnel" echo, digital pitch shifting, flanging and phasing with tape machines, and the use of vocoders. The advanced audio chapter also has a fascinating section on audio-psychology dealing with everything from speaking with the client, to drugs, sleep and fatigue in the control room.

Thus far I have painted a very rosey picture of Sherman Keene's book. However, there are some thorns among the roses. The primary problem is a difficult-to-read typeface resulting from the use of a dot-matrix computer printer in the original manufacture of the book. This, fortunately, is a temporary shortcoming as the author plans shortly to release a new edition of the book printed under better conditions.

Another weak point that I hope will be corrected in future publications is the currently inadequate index, which is limited in its terms and categories. Also, it does not contain any provision for cross-referencing one term or category with another, and lacks any provision for referencing to a specific page in the book. This seriously limits the book's application as a general engineering reference manual.

These weaknesses aside, *Sherman Keene's Practical Technique For The Recording Engineer* is a thorough and readible book that this reviewer would recommend for any individual interested in or involved with the recording industry or related fields.

Steven V. Barker

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STUDIO UPDATE

Northeast:

☐ **MASTER SOUND PRODUCTIONS RECORDING STUDIO** (Long Island, New York) has taken delivery of a Trident TSM console for use in their newly remodeled control room. The new board accommodates up to 80 inputs during remix, and features full automation and split routing for lock-up situations. The console's computer automation system can solo both track groups and individual inputs with complete mute-writing capabilities, as well as performing gain-riding functions, according to engineer **Dave Brody**. Along with the acoustics and cosmetic facelifts, new video equipment has been installed in the control room for monitoring the main studio, in conjunction with additional rooms, for situations requiring multiple room interlock. **Ben Rizzi** is the chief engineer of the studio. *921 Hempstead Turnpike, Franklin Square, NY 11010. (516) 354-3374.*

Master Sound Productions

☐ **RED SNEAKER PRODUCTIONS** (Hopewell Junction, New York) announces the opening of a new 16-track facility located 70 miles north of New York City. **Michael Ginese** is studio manager at Red Sneaker. *Carpenter Road, Hopewell Junction, NY 12533. (914) 226-4869.*

☐ **SEAR SOUND** (New York City) has recently appointed **Christopher Martinez** to the position of Chief Mixer. Martinez' background includes work in both the audio and video fields and, in addition he will act as studio manager for the mid-town facility. *235West 46th Street, New York, NY 10036. (212) 582-5380.*

☐ **SPECTRUM RECORDERS** (Lanesborough, Massachusetts) has opened for business, featuring a 24-track operation with a 25- by 30- by 15-foot music room and 16- by 20-foot control room. Equipment includes an APSI Model 3000 32-in/24-out console, hooked up to an MCI JH-100 24-track and complimented by UREI monitors. Outboards including a Delta-Lab DL-2 digital delay line, Loft delay flanger/doubler, MICMIX reverb, CSR EQ23, plus UREI and dbx limiters are to be found in the effects rack. Clients in to take advantage of the new facility include the **Mark Cushing Band**, the country swing-band **Swing Shift**, and **Shenandoah**, Arlo Guthrie's road band. All sessions were engineered by **Peter Seplow**. *151 South Main Street, Lanesborough, MA 01237. (413) 499-1818.*

—NORTHEAST ACTIVITY—

BOLOGNESE RECORDING STUDIO (North Merrick, New York) is playing host to Canadian country artist **Iris Larratt**, who has been recording an album for RCA, with **Andy DiMartino** producing and **Dave Dachinger** behind the console. Motown Records has signed **Tommy Hill**, whose tracks recorded at Bolognese were slated for April release; tunes were produced by **Rick Tarbox** with Dachinger engineering. Studio manager **James Falcone** reports that clients are pleased with recent renovations to the facilities and acoustics. *989 Jerusalem Avenue, North Merrick, NY 11566. (516) 221-5555.* ■ **NORTH LAKE SOUND** (North White Plains, New York) finds Stiff Records recording artists **Joe "King" Carrasco And The Crowns** completing their new album, produced by **Billy Altman** and engineered by **Eddie Solan**. Also in the studio, **Crazy Joe and The Variable Speed Band** have finished their latest album,

to be represented in the next available issue write:
R-e/p STUDIO UPDATE
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STUDIO UPDATE

NORTHEAST ACTIVITY continued . . .

Eugene, for Polygram Records, produced by **Joe Renda** and engineered by **Chris Cassone**, while **Larry Russell Brown** ("Tie a Yellow Ribbon") is writing and producing for a new band, **The Point**. *3 Lakeview Drive, North White Plains, NY 10603. (914) 682-0842.* ■ At **SECRET SOUND STUDIOS** (New York City) **Rich Calandra** is producing **Spyro Gyra's** latest album for MCA Records. Engineering on the sessions is being handled by **Michael Barry**, assisted by **Steve Baldwin**. Also in the studio, **Arthur Russell** is producing the soundtrack for the Greek play, *Medea*, for The Byrd Hoffman Foundation. **Dennis Drake** is the engineer, assisted by Baldwin. The same engineering team is working with producer **Mitchel Schoenbaum** on a demo recording for the group **3D**. **Rita Leone** is Secret Sound's studio manager. *147 West 24th Street, New York, NY 10011. (212) 691-7674.* ■ **SIGMA SOUND STUDIOS** (New York City) is recording **Stephanie Mills** for her new album produced by **Mtume & Lucas**, with **Jim Dougherty** engineering, assisted by **Craig Michaels**. Down the hall, **Ashford & Simpson** are overdubbing and mixing live tracks for their upcoming double-record set. The duo are producing themselves, with **Jim Hutchinson** engineering, assisted by **John Convertino**. Ashford & Simpson are also producing an Atlantic Records album project for **Ullanda McCullough**, with **Michael Hutchinson**, **Jay Mark**, and **John Potoker** engineering, and **Matthew Weiner** and Covertino assisting. Work is also proceeding on a number of **Candi Staton** tracks for LA Records, with producer **Dave Crawford**, engineer Hutchinson, and assistant Weiner in the booth. *1697 Broadway, New York, NY 10019.* ■ **SIGMA SOUND STUDIOS** (Philadelphia, Pennsylvania) finds **Gloria Gaynor** currently cutting tracks for an upcoming Polygram Records album, with production chores being shared by **McFadden & Whitehead**, while **Dirk Devlin** mans the console, assisted by **Vince Warsavage**. Meanwhile, PIR co-founders **Gamble and Huff** are producing **Teddy Pendergrass'** upcoming LP, with studio head **Joe Garcia** engineering. The same control-room team is also recording a PIR album with **Patti LaBelle**. Other activity includes projects by **The Stylistics**, with **Dexter Wansell** producing and **Jim Gallagher** and assistant **Mike Spitz** engineering, and **Pieces Of A Dream** recording with producer **Grover Washington, Jr.** *212 North 12th Street, Philadelphia, PA 19107.* ■ **SOUNDWORKS** (Dover, New Hampshire) is an audio recording service that also offers production and maintenance to their clientel, which have included **The Boston Symphony Orchestra** and **Maryland Public Radio**. **Fred Portnoy** is the proprietor of Soundworks. Studio equipment includes a ReVox half-track recorder with Dolby-B noise reduction, and mikes by Shure, AKG and Beyer. *P.O. Box 141, Dover, NH 03820. (603) 742-0263.*

Southeast:

☐ **ARTISAN RECORDERS** (Fort Lauderdale, Florida) recently completed remodeling of its mobile recording unit with improvements including an increase in storage and overhead rack space, and increased floor space for tape machines. Recent equipment additions at the studio include an Eventide H-949 Harmonizer® with ALG-3, URSA MAJOR Space Station, plus AKG C-12 and Telefunken U-47 tube microphones. *5077 Northeast 13th Avenue, Fort Lauderdale, FL 33334. (305) 4913132.*

☐ **CARIBESO STUDIOS** (Atlanta, Georgia) has relocated to Little Five Points, upgrading in the process with the addition of a TEAC Tascam 80-8 multitrack with dbx, this in addition to a 3340 4-track. The new BSC console has also been installed along with JBL 4311 and Auratone monitors driven by AB 205 and BGW amps. In addition to location film recordings utilizing a Nagra recorder, owner and engineer **Tomas Valenti** does live recordings from the nearby hall, The Pub. *426 Seminole Avenue North East, Atlanta, GA 30307. (404) 524-3330.*

☐ **HAYES RECORDING STUDIO** (Tampa, Florida) has upgraded with the addition of a 24-track installation, which features an Ampex MM-1200 and a Sphere custom console. Included in the outboard gear is an EXR3 Exciter, Delta-Lab DL2 Acousticomputer, AudioArts parametric EQ, Orban de-esser, and dbx limiter/compressors. Microphones include models by RCA, Neumann, Shure, ElectroVoice, Sony and AKG. According to owner **Paul Hayes**, plans are to add another 24-track room within 14 months. "We're now nine months ahead of schedule on the first 24-track studio," he adds, "so we're hopeful that our current projection can be pushed up a bit." *2406 South MacDill Avenue, Tampa, FL 33609. (813) 837-6384.*

☐ **SOUND CUTTING, INC.** (Fort Lauderdale, Florida) has upgraded its facilities for disk cutting with the addition of new outboard gear, including Inovonics 376 electronics, Orban parametric EQ, Orban compressor/limiter, and Orban stereo synthesizer. Sound Cutting recently mastered sides for **Dizzy Gillespie**, **Thelonius Monk** and **Art Blakey** for Gemcom, **Freddy Cole's** new album on Demand Records, and for 38 classical sides for the new Euphoria label. *5937 Ravenswood Road, H-11, Fort Lauderdale, FL 33312. (305) 966-0680.*

☐ **STRAWBERRY JAM STUDIOS** (West Columbia, South Carolina) has taken delivery of a Lexicon 93 Prime Time DDL processor and Lexicon 224 digital reverb system. Sales were handled by Trackside Engineering of Smyrna, Georgia. *3964 Apian Way, West Columbia, SC 29169. (803) 356-4540.*

☐ **SUNSHINE BAND ENTERPRISES, INC.** (Miami, Florida) has opened its doors to the public. The new facility, owned by **Harry Wayne Casey** and **Richard Finch** of **KC and the Sunshine Band**, features an MCI JH-528 modified console feeding an Ampex MM-1200 24-track machine, and two ATR-120 2track recorders. The monitor system was custom-built, and features JBL/TAD components; other equipment includes a complete disk mastering system with a Scully lathe and Ortofon cutting head. **KC** and **Leif Garrett** have both recently finished projects, and **Bobby Cladwell** is currently recording in the complex. **Milan Bogdan** is the studio manager and chief engineer. *7764 North West 71 Street, Miami, FL 33166. (305) 592-1014.*

—SOUTHEAST ACTIVITY—

ARTISAN RECORDERS (Fort Lauderdale, Florida) Mobile Unit recently completed the first successful remote digital recording in the State, using a Mitsubishi X-80 PCM recorder to capture the Fort Lauderdale Symphony Orchestra live at the Fort Lauderdale War Memorial Auditorium; **Peter Yianilos** and **Richard Hilton** engineered. The unit also recorded **Wendell Adkins'** *Third Wave album at Whiskey River in Fort Lauderdale*; **Peter Archer** produced the album, with Yianilos and Hilton engineering. *5077 Northeast 13th Avenue, Fort Lauderdale, FL 33334. (305) 491-3132.* ■ **CRITERIA STUDIOS** (Miami, Florida) reports the reggae artists **Third World** are in laying down tracks for their self-produced album, tentatively confirmed on the CBS International label. **Bruce Hansal** is engineering the project. Down the hall, Handshake Records' artist **Ron Dante** is combining tracks with video taping in Studio A. Dante is producing the album with **Paul Schaeffer**, while chores at the console are handled by **Geoff Howe** and **Joe Foglia**. Also at the studio, **Julio Iglesias** is working on a new Spanish language album with producer **Ramon Arcusa**, assisted by **Bob Castle**. *1755 North East 149th Street, Miami, FL 33181. (305) 947-5611.* ■ At **dgp STUDIOS** (North Miami, Florida) **Peter Olach** is near the mixing stage on his *Love Hunter* album. He is being supported by Blood, Sweat and Tears' drummer **Bobby Economeu**, bassist **John Goodwin**, and keyboardist **Brian Bec Var**, late of Bobby Caldwell. **Gary Vandy** is engineering the project, assisted by dgp's **Jeff Dean** and **Ted Stein**, along with **John Alderson**. Meanwhile, **Toni Bishop** is recording a single with Stein engineering, and **The Rocker Band** is recording a collection of tracks with Dean assisted by Stein behind the console. *1975 North East 149th Street, North Miami, FL 33181 (305) 940-6999.* ■ **JALEX RECORDING STUDIOS** (West Palm Beach, Florida) has completed the first album by **The Mike's Towing Band**, co-engineered by **Bill Harriss** and **Clinton Smith**. Also, **Tom Cherry** and **Dean Slocum**, while on tour in the area with Boots Randolf, recorded a session with **Louis Lane**, engineered by **Jon Lind**. *319 Clematia Street, West Palm Beach, FL 33401. (305) 832-1538.* ■ **QUADRADIALL RECORDING STUDIO** (Miami, Florida) announces the addition of **Jerry Thichava** to its engineering staff. Thichava is a graduate of Memphis State University, where he studied music and recording. Activity at the studio includes **Barry Mraz** producing and engineering an album by **David Johansen**, late of the New York Dolls. The project is for Blue Sky Records/CBS. Also in Quadradial, **Betty Wright** has been producing **Jeremiah Burden** and **Margaret Reynolds**, with Thichava behind the console assisted by **Paul Speck**. **Mary Shahan**

. . . *continued on opposite page* —

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STUDIO UPDATE

is the studio manager. *14203 North East 18th Avenue, Miami, FL 33141.* ■ **SUNSHINE SOUND** (Miami, Florida) is recording **Jimmy "Bo" Horne's** forthcoming LP, *See Things As They Are, while* **Steve Bogard** is cutting tracks, and **Formula VI** finishes their latest LP. *P.O. Box 1780, Hialeah, FL 33011 (305) 888-1685.* ■ **TRIAD RECORDING STUDIOS** (Fort Lauderdale, Florida) reports that **The Crystal Caine Band** has been tracking their first album, with **Steve Gaudet** and **Michael Laskow** co-producing, and **Robert Corti** assisting at the panel. Also, singer **Jim Attias** has reached the mixing stages of his recording at Triad. Arranger/producer **Tom Hartman** has been working on the sessions with engineering chores split between Laskow and **Vinceny Oliveri**. *5075 North East 13th Avenue, Fort Lauderdale, FL 33334. (305) 771-1431* ■ **WEB IV STUDIO** (Atlanta, Georgia) reports that **The Commodores** are in recording tracks for their next album, with **James Carmichael** producing the band and **Carl Harris** behind the desk with assistant **Ed Seay**. Studio manager at Web IV is **David Powell**. *9400 Roberts Drive, Atlanta, GA 30338. (404) 325-0832.*

South Central:

☐ **ACA RECORDING STUDIOS** (Houston, Texas) has purchased a new array of keyboards including a Baldwin 9-foot concert grand piano, a Hammond B-3 and RT3 organs with Leslie, Fender Rhodes 73, Mini-Moog, and Prophet 5 synthesizers, and a Mellotron. ACA has also been experimenting with a new line of modular synthesizers from PAIA Electronics. *8208 Westpark, Houston, TX 77063. (713) 783-1771.*

☐ **THE AVERAGE JOE PRODUCTIONS** (Denton, Texas) is a new 8-track facility equipped with an Otari 8-track and TEAC 2-track recorders, Nakamichi cassette deck, Biamp 16-in/5-out stereo mixer, QSC amps, reverb, delay, stereo phasing, limiters, 10—band EQ. The recording area is large enough to accommodate big band recording, and rehearsal. Engineers are **Mike Itashiki** and **Guy Moscoso**. *313 North Locust, Denton, TX 76201.*

☐ **INFINITY RECORDING STUDIOS** (Tulsa, Oklahoma) has re-opened following completion of its new live-end/dead-end control room. New equipment includes an Allen & Heath Modular III Series console, JBL 4311 monitors, Mini-Moog synthesizer, and a Fender Rhodes electric piano. For sound reinforcement, a modified Carvin 16-in/8-out stereo console has been added for stage sub-mixing, along with seven Ampex and Carlson-Stromberg power amps for back-up use and stage amplification. Activity includes work by **The Works**, a Colorado-based band, and **Dick Loftin** remixing selected cuts for his album *Writer. 1750 South Harvard, P.O. Box 4344, Tulsa OK 74112 (918) 932-4261.*

☐ **ISLAND RECORDERS** (Nashville, Tennessee), formerly Richey House, has added 24 tracks of dbx and Dolby noise-reduction to its facility. Other recent equipment purchases include an Ecoplate, Audio & Design Vocal Stressor, Lexicon Prime-Time, and an increased compliment of outboards and microphones. Island's general manager is **Fred Vail**. *Nashville, TN.*

☐ **SOUND EMPORIUM STUDIOS** (Nashville, Tennessee) has purchased a new Harrison MR-2 console for use in their newly-opened Studio C. The new desk features all transformerless mike pre-amps, separate return levels for cue echo, automated fader, and "Sigma-Cue," which allows simultaneous monitoring of both a live source and a tape machine until the machine starts recording. The console is currently operating with 24-tracks, but has a channel assignment capability allowing expansion to 48-tracks. Studio president **Jim Williamson** announced the acquisition of the new console. The **Marshall Tucker Band** has returned to Sound Emporium, with producer **Tom Dowd**, to finish their upcoming Warner album, *Ride In Peace*, dedicated to their late bass player, Tommy Caldwell. **Kevin Herron** is engineering, assisted by **Gary Laney**. Also in the studio, **Andy Williams** is finishing up his new CBS album, while

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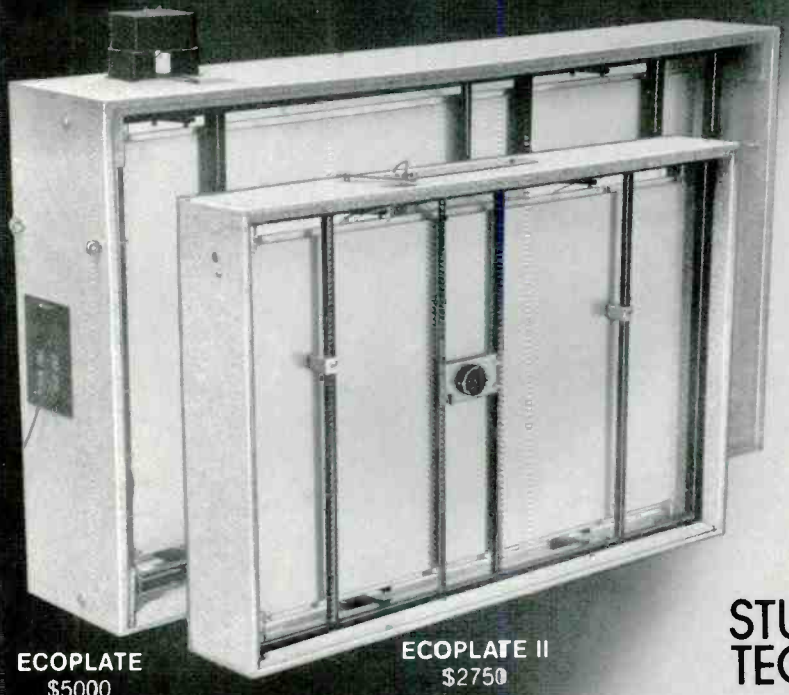

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South Central continued . . .

mixing continues on **Merle Haggard**'s upcoming gospel album for MCA. *3120 Belmont Boulevard, Nashville, TN 37212. (615) 383-1982.*

☐ **ULTRASONIC STUDIOS** (New Orleans, Louisiana) has announced it's upgrading to a 24-track facility. In addition to a new MCI JH-24 multitrack, the studio has increased the signal processing gear and studio instrument selection during the past four years of operation. Owners/engineers of Ultrasonic are **Jay Gallagher** and **George Hollowell**. *7210 Washington Avenue, New Orleans, 70125. (504) 486-4873.*

☐ **VILLAGE MEDIA RECORDING** (Summertown, Tennessee) has seen the release of the album *Reactor* by the **Nuclear Regulatory Commission**, on Official Records. The album was recorded in Village's 8-track studio, which features a Sound Workshop 1280-B board, Otari MX5050 recorder, and mikes by ReVox, Shure, and Electro-Voice. Village Recording is located on The Farm community in Summertown, also the site of a book publishing company, an electronics manufacturing firm, and a color video studio. All ventures are linked under the Village Media label. *156 Drakes Lane, Summertown, TN 38483. (615) 964-2286.*

—SOUTH CENTRAL ACTIVITY—

ACA RECORDING (Houston, Texas), has completed dates for **Issac Payton Sweat** *(King Of The Cotton-Eyed-Joe)* a new LP with **Bill Holford** and **Andy Bradley** engineering, and an album for Church of the Redeemer, **Ray Prickett** and Bill Holford engineering. Houston's premier New Wave group, **Really Red**, has also recorded their debut LP. **Johnny Blaine** is also cutting a second single, with Bradley engineering and **Art Gottschalk** producing. *8208 Westpark, Houston, TX 77063. (713) 783-1771.* ■ At **ARDENT RECORDING** (Memphis, Tennessee) **Carla Thomas** has been putting the finishing touches to a new project for World Productions; **Homer Banks** and **Chuck Brooks** are producing, with engineers **William Brown** and **Robert Jackson**. The group **Kwick** was in the studio recording a new album, *To The Point*, produced by **Allen Jones** and engineered by Brown and Jackson. Also, **ZZ TOP** has been at Ardent working on a new album for Warner Brothers; **Bill Ham** producing, with **Terry Manning** engineering. **Gary Chapman** has recorded an album, titled *Sincerely Yours*, produced by **Joe Hardy, Ed DeGarmo** and **Dana Key**. *2000 Madison Avenue, Memphis, TN 38104.* ■ **BRIGHTON ROAD PRODUCTIONS** (Austin, Texas) is recording **Welcome**, a three-piece band from Switzerland, produced by **Johnnie Burns**, of Hit and Run Music, London. Burns' credits include Genesis' album, *Lamb Lies Down On Broadway*, while engineer **Richard Whaley**"s credits include handling console duties on ELO's *El Dorado*. **Russell Whitaker** and **Peter Butcher** are president and vice-president of Brighton respectively. *5012 Brighton Road, Austin, TX 78745. (512) 444-0183.* ■ Recent artists using **ISLAND RECORDERS** (Nashville, Tennessee), formerly Richey House, include **George Jones** and **Tammy Wynette**, produced by **George Richey**, and engineered by **Dave Shipley** and **Dave Hieronymus**, for the motion-picture soundtrack, *The Night The Lights Went Out In Georgia*. Also: **Christy Lane**, produced by **Jerry Gillespie** for Liberty Records; and **Nightstreet**, produced by **Jerry Taylor** for Epic Records. *Nashville, TN.* ■ **MUSIC CITY MUSIC HALL** (Nashville, Tennessee) reports that **Terry McMillan** is in recording his first single for RCA, with **Chet Atkins** overseeing the production engineered by **Bill Harris**, while RCA's new Nashville head of A&R, **Norro Wilson**, is in Music Hall working on several projects, including albums by **Charlie Pride** and **Jerry Reed**. Harris is also engineering these sessions. Other activity includes **Jerry Bradley** producing **Dean Dillon**'s latest single for RCA, while **The Lewis Family** puts down tracks for their upcoming album, with **Herman Harper** producing and **Bill Vandevort** engineering for World Records. *25 Music Square East, Nashville, TN 37203. (615) 244-1060.* ■ **OMEGA AUDIO** (Dallas, Texas) has kept its 24-track remote recording unit active, providing audio support for the video program *Country Magic*, recorded at the Houston Astrodome. The program, produced by **Alvin Cooperman** and **Judith DePaul** of New York, slated such artists as **Johnny Cash, Helen Reddy, Eddie Rabbitt**, and **Mickey Gilley**. Omega recorded the shows using SMPTE time codes for later mixdown and post—production audio sweetening. Sound reinforcement was provided by **SHOWCO** of Dallas; video facilities were handled by **Northwest Teleproductions** of Minneapolis and **Southwest Producer's Service** of Dallas. *2805 Cover Valley Drive, Garland, TX 75043. (214) 226-7179.* ■ **PETE'S PLACE STUDIOS** (Nashville, Tennesse) finds **Geoff Morgan** of Pi-Gem Music in producing an album for **Judy Eron**, while **Tommy Cash** is in with producer/studio owner **Pete Drake**. Overdubbing was also being done by **Ronnie Prophet** and **Carmol Taylor** on their respective projects, while **Dan Hoffman** was recording various artists for his company. *809 18th Street South, Nashville, TN 37203. (615) 327-3211.* ■ **POLYMUSIC STUDIOS** (Birmingham, Alabama) finds **Johnny Sandlin** in producing and engineering tracks for the southern rock band, **Telluride**, for its first album project. **Michael Panepento** is assisting in the control room. *225 Oxmoor Circle, Suite 812, Birmingham, AL 35209. (205) 942-3222.* ■ **REELSOUND RECORDING COMPANY** (Manchaca, Texas) recently completed dates with **Amy Grant and The DeGarmo and Key Band** for a live album for World Records. The concerts were recorded in Tulsa and Norman, Oklahoma, with production by **Blanton and Harrell Productions**. Engineering was handled by **Jack Puig, Malcolm Harper, Chuck Suger**, and **Mark Gitterle**. *P.O. Box 280, Manchaca, TX 78652. (512) 472-3325.* ■ ***WOODLAND SOUND STUDIOS*** (Nashville, Tennessee) reports that **Paul Williams** was in recently to record an album on their 3M digital 4track equipment. **Charles Underwood** produced the live sessions, with **Rick McCollister** engineering, and **Mike Porter** and **Kerry Kopp** assisting. **Conway Twitty** and his co-producer **Ron Chancey** have also been in working on Twitty's upcoming project for MCA Records. **Danny Hilley** is engineering the dates with assistant **Russ Martin**, while **John McCuen** is overdubbing for his Aspen Recording Society album with **David McKinley** at the console. *Nashville, TN.*

Midwest:

☐ **AUDIOCRAFT RECORDING COMPANY** (Cincinnati, Ohio) has recently taken delivery of a new Allen & Heath Syncon Series B 28-channel mixing console. **Bud Herzog**, president of Audiocraft, made the purchase decision as a result of expansion of the company's Sound Images division, whose client list includes Proctor & Gamble, Sears, Zenith, and Bell Telephone. Installation was a joint venture between the studio staff and **ICB Audio Company** of Erlanger, Kentucky. *Cincinnati, OH. (513) 241-4304.*

☐ **DUNGEON RECORDING STUDIO** (Springfield, Missouri) announces that complete upgrading of its operation from a 16-track to a 24-track MCI-equipped studio. **Pat Shikany**, owner of Dungeon, stated that, along with the new recording gear, the facility offers UREI Time-Align™, JBL 4333s, and Auratones for monitoring, as well as a collection of outboard gear, including a Lexicon 93 Prime Time DDL, parametric and graphic equalizers, AKG and MICMIX Master-Room reverb, EXR Exciter, noise gates, UREI LA-4 and 1176, dbx 160s, and Pandora limiters, and Ampex 2-track machines for mastering. Mikes include Neumann U-87s, Neumann and Telefunken 48 tube mikes, AKG 414s and models by Sony, Sennheiser, and Shure. Instruments include a Kawai grand piano, Hammond B3 organ, ARP 2600, and a new Gretch drum kit. An assortment of guitars and amps is also available. *212 West McDaniel Street, P.O. Box 1571 S.S.S., Springfield, MO 65806.*

☐ **GERIM RECORDING** (Chicago, Illinois), formerly The Chess Studios, is a two studio facility offering a 24-track room equipped with an Amek 28-in/24-out console feeding an MCI 24-track recorder, and interfaced with monitors by UREI and Century III. A separate 16-track room utilizes a pair of TEAC Tascam Model 5 consoles and a Tascam 90-16 multitrack machine, with monitors by JBL. *2120 South Michigan Avenue, Chicago, IL 60616. (312) 326-5450.*

☐ **KOPPERHEAD PRODUCTIONS** (North Canton, Ohio) has announced that construction has begun on their new recording facility, which includes a studio and control room designed by **John Storyk**; a composition an creative room, musicians' lounge, warm-up rooms; and a voice-over and dub room. The control room will be equipped with UREI Time Aligned™ monitors, Carver and Crown power amps, a Tascam 90-16 tape deck with dbx, custom tape location counters and remotes, a TEAC Tascam Model 15-S control board with 20 input/output modules (modifications by **Suntronics** of Upland, CA). Kepex II and Gain Brain II, Eventide Harmonizer,

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STUDIO UPDATE

AKG and Orban reverbs, and numerous other peripherals. The Studio will have a Baldwin 6'3" Grand Piano and Slingerland drum set. A uniquely intefaced synthesizer set consisting of an ARP 22600, Minimoog, and Polymoog will be available for rental. An Apple II microcomputer with custom programs is used for all studio related paper work, including log sheets. Completion date is currently set for June 1, 1981. *470 West Mohawk, Malvern, Ohio 44644. (216) 863-0835.*

Studio M

☐ **STUDIO M** (Saint Paul, Minnesota), also known as The Maud Moon Weyerhauser Music Studio, has been built as a part of Minnesota Public Radio's new production center in Saint Paul. Studio M is one of two multitrack rooms designed for the building, which also features seven additional broadcasting and production studios. The studio was designed by Leonard Parker Associates, Architects, with Robert A. Hansen, Acoustical Consultant. Its 50,000 cubic feet of space features an 18-foot wide arched window, constructed with an acrylic poly-cylindrical treatment. The control room is centered around an MCI JH-600 Series automated console, coupled to MCI 24-track and 4-track recorders, and to a 2-track Studer recorder. Also featured is 32 tracks of Dolby noise reduction, a full range of ancillary gear, and UREI 815 monitors. Turnkey installation was by **Sound 80 Inc.** of Minneapolis. Since its opening, the studio has played host to the radio serialization of Star Wars for National Public Radio, in association with LucasFilms, Ltd., and the facility will soon be open to public bookings. *45 East Eighth Street, Saint Paul, MN 55101. (612) 221-1500.*

Thousand Dollar Wine

☐ **THOUSAND DOLLAR WINE STUDIOS** (Columbia, Illinois) announces the completion of its new 8-track facility, which features a TEAC Tascam 80-8 multitrack, fed by a TEAC 515 AX 16-channel console. Limiters are by dbx and Ashley, with parametric EQ by Furman and Tapco. Noise reduction is provided by dbx; other sideboards include Orban reverberation, MXR Flanger/Doubler, and Audio Pulse DDL. Monitors are Altec 604s. JBL 4313s and Auratones. Microphones are by Shure, Electro-Voice, AKG, and Sony. The announcement was made by **Jim Whelson** and **Jim Doiron**. *549 Wilson Hills, Columbia, IL 62236. (618) 281-5051.*

—MID-WEST ACTIVITY—

AUDIOLOFT STUDIOS (Macks Creek, Missouri) has completed two albums for fiddle player **Gordon Terry** of the Merle Haggard Show. The studio also recently installed a new Lexicon Prime-Time DDL. *P.O. Box 7-11, Macks Creek, MO 65786. (314) 363-5432.* ■ **UNIVERSAL RECORDING CORP.** (Chicago, Illinois) has utilized its recently installed 3M digital recorder on a variety of sessions. One of the first featured **The Dave Brubeck Quartet** and **The Cincinnati Symphony Orchestra**, teamed for a project entitled *To Hope: A Celebration*. The dates were engineered by **Judy Sherman** and produced by **Russel Gloyd**. Others taking advantage of digital technology include PBS for a soundtrack of the film *Come Along With Me*, directed by Joanne Woodward. **Richard Manners** composed the score, while **Bill Bradley** served as the engineer for the sessions. **THE Chi-Lites** are also using the digital system for their new album with **Bill Brady** at the console, and production by **Carl Davis** and **Eugene Record**. Other work has been booked by various advertising and jingle firms. *46 East Walton Street, Chicago, IL 60611. (312) 642-4354.*

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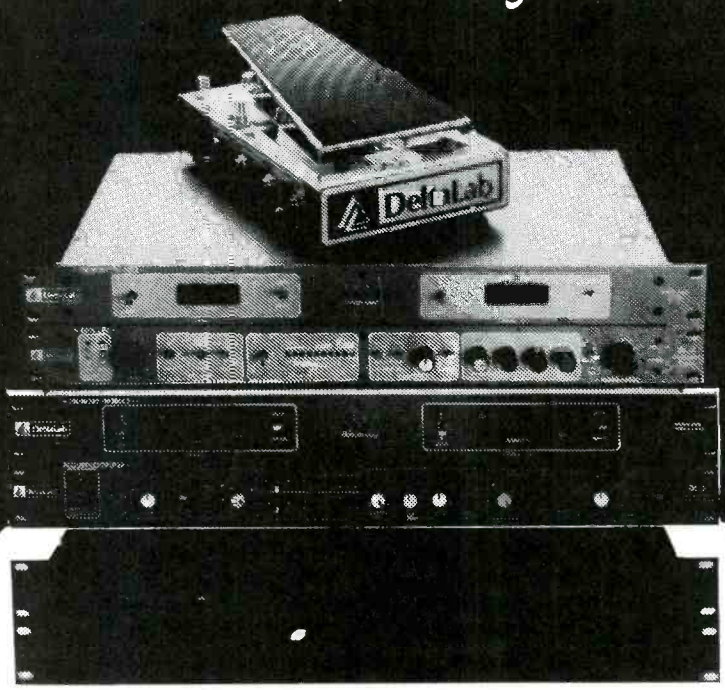

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STUDIO UPDATE

Mountain States:

☐ **AUDIO VISION STUDIOS** (Lindon, Utah) is installing an International Consoles Corporation *3000 Series* mixing console, equipped with 24-channels and full automation. The facility, slated for an early spring opening, is also equipped with I.C.C. monitors in Wedge™ designed audio control rooms. **Sam Foster** is the studio owner, with **Loren Ashcraft** acting as chief engineer. *74 East Center Street, Lindon Utah. (801) 785-0077.*

☐ **BONNEVILLE PRODUCTIONS** (Salt Lake City, Utah) has upgraded its 24-track Studio C facility with the installation of UREI 813 Time-Aligned™ monitor speakers, each powered with 800 watts of Crest amplification. Studio C, the only 24-track studio in Salt Lake City, features Ampex MM-1200 24-track, MM-1100 16-track, and ATR-102 two-track machines with full Dolby and dbx noise reduction. Bonneville's Studio B has also been remodeled to create a more acoustically pure environment, and has added Big Red Monitors. In addition Studio B's control room has a new Ampex ATR-104 four-track recorder, and is equipped for looping (lip-sync) operation. *130 Social Hall Avenue, Salt Lake City, UT 84116 (801) 237-2600.*

☐ **J.V.J. RECORDING STUDIO,** (Flagstaff, Arizona) has announced completion of its new 8-track facility, which features a TEAC Tascam 80-8 with dbx, Model 5-A mixing console, a TEAC A-7300 2-track, dbx compressor limiters, MXR Flanger/Doubler, Tapco EQ and reverb and Omni-Craft noise gates. Altec-Lansing monitors are powered by BGW amps. Mikes are by Audio-Technica and Shure, with Kelsey direct boxes. Other services include record pressing, and tape duplication. **Julian, Viola,** and **Jay Diaz** are the studio's owners, with Julian Diaz as chief recording engineer. *22 Ridge Crest Drive, Flagstaff, AZ 86001. (602) 774-8113.*

—MOUNTAIN STATES ACTIVITY—

CARIBOU RANCH (Nederland, Colorado) finds **Dan Fogelberg** doing over-dubs for his new album, co-producing himself with engineer **Marty Lewis**. **David Giorgini** and **Jerry Mahler** are assisting. *Nederland, CO 80466.* ■ **LISTEN UP AUDIO** (Denver, Colorado) reports recording **38-Special** in concert at Denver's Rainbow Music Hall, where Listen Up has installed a permanent 24-channel, 16-track facility. The gear is available to all groups who play Rainbow Music Hall, which is also capable of broadcast and satellite feeds. 38-Special was recorded in conjunction with video taping the band for overseas promotion and possible U.S. release. Producer for the project was **Rodney Mills**, with **Norm Simmer** engineering, assisted by **Thomas Lang**. Past projects have included **Steve Forbert, The Motels,** and **Stanley Clarke**. *685 South Pearl Street, Denver, CO 80209. (303) 778-0780.*

Southern California:

☐ **CANTRAX RECORDERS** (Long Beach) announces a new line-up of equipment, including gear by Studer, Tascam, ReVox, Yamaha, JBL, dbx, Technics, and Sound Workshop. Owner **Richard Cannata** also reports a full range of instruments available for client use. *1720 Park Avenue, Long Beach, CA 90815. (213) 498-6492.*

☐ **CASBAH STUDIO** (Fullerton) has taken delivery of a new TEAC Tascam 85-16 16-track recorder. The control room is also being redesigned, and the studio's TEAC Model 15 console updated. **John St. James** is currently producing jingles for radio station KMET. *1895 Commonwealth, Fullerton, CA 92633. (213) 738-9240.*

☐ **DIGITAL SOUND RECORDING** (Los Angeles) has completed a major enlargement of its music room. Owner/engineer **Van Webster** designed the addition, which doubled the size of the studio. Features include large wooden baffles to enable the acoustical environment to be fully adjustable. Digital Sound Recording, formerly Hope Street Studio, has also acquired several tube-type microphones, including Neumann U47, and SM2 models. The studio features an MCI console, 3M Series M79 24-track recorder, plus digital mastering with the Sony PCM-1600. Remote digital recording is also offered. Studio manager is **Christy Robertson**, with staff engineers **Jim Baurlein** and **Stuart Schonwetter**. *607 North Avenue 64, Los Angeles, CA 90042. (213) 258-0048.*

☐ **GOPHER BAROQUE PRODUCTIONS** (Garden Grove) has upgraded to 16-track with the addition of a TEAC Tascam 85-16 multitrack interfaced with a modified Tascam Model 15 mixer. In addition, the studio has acquired a Yamaha C-7 grand piano which, along with a Hammond B-3 organ, Fender-Rhodes, ARP Omni, Clavinet, and tack piano, are available at no extra charge to clients. Engineers from **Suntronics** (Upland, California) also recently re-tuned the control room using Klark Teknik third-octave equalizers. The announcements were made by owners **Michael Mikulka** and **Steve McClintock**. *12202 Garnet Circle, Garden Grove, CA 92645. (714) 893-3457.*

☐ **Hal** and **Vio Michael** have announced the completion of their new **SPINDLETOP RECORDING STUDIOS** (Hollywood). Co-designed by Hal and Vio Michael and **Scott Putnam**, and built by Scott Putnam, the studio is said to demonstrate the current state-of-the-art in acoustic design, decor, construction, and equipment, showcasing the latest MCI innovations.

The studio features an MCI 636 console, complete with JH-50 automation, JH-24 24-track recorders, JH-110B ¼-inch 2-track recorder, JH-110B ½-inch 4-track recorder, JH-110B ½-inch 2-track mastering recorder, and JH-45 SMPTE/EBU Based Generator/Synchronizer, providing the capability of 48-track audio as well as video interlock. A Yamaha C-7 grand piano and a variety of keyboards allow Spindletop to offer the artist, producer, and engineer total flexibility in any recording situation.

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☐ **UNICORN STUDIOS** (Los Angeles) formerly Star Track Studios, is now available for bookings after having been taken over by **Nadya Bell**, and after extensive remodeling of the entire 24-track studio. *8615 Santa Monica Bl., Los Angeles, CA 90069 (213) 652-2070.*

—SOUTHERN CALIFORNIA ACTIVITY—

At **ARTISAN RECORDERS** (Hollywood) engineer **Gregory Fulginiti** is mastering new albums for **The Grateful Dead** on Arista Records, with **Betty Cantor-Jackson** producing. Fulginiti is also cutting a disk for **Joe Pass** for Pablo Records, and also for RCA's **Rich Springfield** with **Keith Olsen** producing. *1600 North Wilcox Avenue, Hollywood, CA 90028. (213) 843-8096.* ■ At **CLOVER RECORDERS** (Hollywood) **Michael Jackson** is in producing **Robben Ford** tracks for Electra/Asylum, with **Jim Nipar** engineering. Jackson is also doing final production on **Red Ryder's** album for Capitol Records, with **Toby Scott** at the controls. Also in the studio is Capitol artist **Gary O'Connor** with producer **Richard Landis** and engineer **Joe Chiccarelli**. Producer **Ray Manzarek** with engineer **Clay Rose** is working on a project with "X" for Slash Records. *6232 Santa Monica Boulevard, Hollywood, CA 90038. (213) 4632371.* ■ At **INTERNATIONAL AUTOMATED MEDIA** (Irvine), **STYX, The Police, Ambrosia, James Taylor, J. Geils, The Moody Blues, Chick Corea, Little Feat, Joan Baez, Eric Clapton** and **Rita Coolidge** have been re-mastering past LPs using IAM's half-speed cutting capabilities. By cutting the original lacquer at half speed, the cut is said to be cleaner and makes the stampers more resistant to sticking and wear, which improves the quality, particularly on percussive and high frequency material — as well as the consistency of the pressings. *17422 Murphy Avenue, Irvine, CA 92714. (714) 751-2015.* ■ **KENDUN RECORDERS** (Burbank) was the facility used by **Reo Speedwagon** for their latest album, *Hi-Infidelity,* produced by **Kevin Cronin, Gary Richrath,** and **Kevin Beamish**. Mastering of the album was handled by studio owner **Kent Duncan**. Also at Kendun, **John Stronach** is producing and engineering **Russia**, who are . . . *continued on opposite page* —

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STUDIO UPDATE

currently mixing their latest project in Studio 1, with **Ron Alverez** assisting. Other activity includes Philadelphia International artist **Jean Carn** in Studio D, with producer **Norman Conners** and engineer **Jackson Schwartz**, plus **Michael Colin Young** recording for Elektra Records, with **MicaelL P. Jackson** producing, and **Jim Nipar** and **Tom Cummings** at the console. *619 South Glenwood Place, Burbank, CA 91506. (213) 843-8096.* ■ **MONTEREY SOUND STUDIOS** (Glendale) finds **The Tubes** currently doing over-dubs for their upcoming album, produced by **David Foster** with **Humberto Gatica** at the console. **Les Brockmann** and **Paul Lani** are assisting. Also at Monterey, **Bell & James** are mixing their latest album for A&M, with **Don Murray** at the controls and Lani assisting. JVC Records artist **Don Grusin** recorded his entire album at the studio, with producer **Toshi Endo** and engineer **Geoff Gillette**. *230 South Orange Street, Glendale, CA 91204. (213) 240-9046.* ■ **RUSK SOUND STUDIOS** (Hollywood) reports activity at the studio includes **Keith Forsey** producing himself, along with **Giorgio Moroder**, on tracks for an upcoming album, with **Juergen Koppers** engineering assisted by **Steven Smith. Sue Ann Carwell** was also in with Koppers and Smith and producer **Pete Bellotte**, laying down an album for Warner Brothers, which was completed in just 14 days. *1556 North La Brea Avenue, Hollywood, CA 90028. (213) 4626477.* ■ **SKYLIGHT EXCHANGE RECORDING STUDIOS** (Granada Hills) has been recording solo artist **Rory O'Brian**, while **Jeff McGinnis** is in mixing tracks, producing for Dory Records. Also, **Jeff Naideau**, noted L.A. session keyboardist, is preparing a debut solo project. Additions to the facility include a Kimball grand piano. *P.O. Box 3173, Granada Hills, CA 91344. (213) 363-8151.* ■ **SOUNDCASTLE** (Los Angeles) reports that **Poco** is in laying down basic tracks for an MCA album with **Mike Flicker** producing and engineering, while **Rita Coolidge** is in doing over-dubs for her new album on A&M; **Andrew Gold** is producing with **Jim Nipar** at the board. Also in Soundcastle, **Patrick Henderson** is producing the **West Los Angeles Sanctuary Choir** with engineering handled by **Bill Bottrell** and **David Marquette** for New Benson Records. *2840 Rowenc Avenue, Los Angeles, CA 90039. (213) 6655201.* ■ **STUDIO SOUND RECORDERS** (North Hollywood) finds **Natalie Cole** in doing tracks for her upcoming Capitol LP, with **George Tobin** producing and **H. Lee Wolen** engineering. Also, **Jose Quintana** is producing the final mix-downs for Latin American artist **Jose Jose**, with Wolen again at the console. Songwriter **Jack Lee** is also in producing his debut album for Made in America Records. *11337 Burbank Boulevard, North Hollywood, CA 91601. (213) 506-4487.* ■ **SUNSET SOUND STUDIO** (Hollywood) finds **Donn Landee** completing the mix on the new **Van Halen** album for Warner Brothers, produced by **Ted Templemen.** Engineering assitance was offered by **Gene Meros.** Also, **Elton John** has finished tracks on his new album for Geffen Records, with Pretenders' producer **Chris Thomas** in the control booth and engineer **Bill Price** with assistant **Steven McManus.** In Sunset's Studio 2, **Dennis Kirk** is producing and engineering **Tina Turner's** upcoming release, with the assistance of **David Leonard.** Down the hall in Studio 3, the **Brothers Johnson** are doing over-dubs for their upcoming A&M album, with engineering handled by **Jack Puig** assisted by **Richard McKernan.** *6650 Sunset Boulevard, Hollywood, CA 90028. (213) 4691186.* ■ **WESTLAKE AUDIO** (Los Angeles) has been recording **The Oingo Boingo Band**, with **Pete Solley** producing for A&M Records and **Brad Gilderman** engineering. Also in Westlake, **Billy & The Beaters** have been mixing the video of their live Roxy appearance, with **Jeff Baxter** producing and **Larry Rebhun** acting as engineer with assistants **Ed Cherney** and **Dave Connors.** Also, **Giorgio Moroder** has been producing **Madeline Kane's** upcoming album with **Brian Reeves** at the desk. *6311 Wilshire Boulevard, Los Angeles, CA 90048. (213) 655-0303.*

Northern California:

☐ **Michael Fusaro** was recently named Chief Engineer at **THE AUTOMATT** (San Francisco) by studio owner/producer **David Rubinson.** Fusaro was assistant supervisor at CBS' San Francisco studios from 1971 to 1978, and has worked in engineering and maintenance with both Fantasy Studios and Coast Recording. *827 Folsom Street, San Francisco, CA 94107. (415) 777-2930.*

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STUDIO UPDATE

Northern California . . . continued —

☐ **THE ANGEL VOICE RECORDING COMPANY** (San Jose) has its new 24-track recording studio currently under construction, which will be open for business in late Spring of this year. The studio will be equipped with a new Sphere 32 in/out console interfaced with an Ampex MM-1200 multitrack and an array of outboard gear. A Prophet 10 keyboard will also be offered. The facility is being built from the ground up — with construction sponsored by the Light of the World Apostolic Cathedral, Inc. of San Jose. The studio will be open to the public for demos, album projects, commercials, and video tape over-dub master production. *2500 Senter Road, San Jose, CA 95111. (408) 292-7930.*

☐ **HARBOUR SOUND** (Sausalito) formerly a Scott Putnam designed 8-track facility for in-house production by White Rabbit Artist Management, has converted to a 24-track automated studio with extensive remodeling and the addition of an MCI JH-636 console equipped with parametric EQ. Tape machines comprise MCI 24- and 2- track decks, with outboard racks filled with gear by Delta-Lab, Orban, EMT, and UREI. Monitors will be by Altec, Rogers and JBL. **Nancy Evans** and **Dana Chappelle**, formerly of Sonoma Recording, will join **Marnie Moore**, late of Heiders, San Francisco, and **Paul Stubblebine** from The Automatt as staff engineers. *301 Harbor Drive, Sausalito, CA 94965. (415) 332-0983.*

☐ **HUN SOUND RECORDING STUDIOS** (San Raphael), has reopened Studio A, which features an MCI 16-track recorder with autolocator coupled to a Tangent Series 16 console. The control room and studio were designed by Hun Sound and staff. The Booth offers Crown amps, White sixth-octave EQ, Eastern Acoustic Works monitors and Auratones. Signal processing gear includes de-essers, reverbs, DDLs, parametrics and comp-limiters. Also under the same roof at Hun Sound, several synchronized-to-video music productions are being produced in association with local station KTIM, under the name *Hun Sound Live. 647 Irwin Street, San Rafael, CA 94901. (415) 2911.*

☐ **HYDE STREET STUDIOS** (San Francisco) reports that its Studio D is now open for mixdown, featuring a 40-input Trident console, Otari and Studer recorders, and UREI Time-Align™ monitors. The music room itself will be open later this Spring with **Michael Ward**'s completion of the new rock walls. *245 Hyde Street, San Francisco, CA 94102. (415) 441-8934.*

☐ **PRAIRIE SUN RECORDING STUDIO** (Petaluma), has opened their new facility, which features a 3M M79 24-track recorder and a wide array of outboard gear. The studio control room was designed by acoustician **Dennis Rice,** late of Filmways/Heider of San Francisco. **Van Morrison** was among the first artists to take advantage of the new installation, laying down some vocal tracks with engineer **Jim Stern**, who was assisted by Prairie Sun's chief engineer **Steve Peterson**. The complex is located on an 11-acre ranch in Sonoma County. *1034A Scott Street, Petaluma, Ca 94952. (707) 778-7175.*

—NORTHERN CALIFORNIA ACTIVITY—

THE AUTOMATT (San Francisco) reports that **Santana** recently finished their latest LP, *Zebop,* for CBS Records, with **Bill Graham** producing in association with **Devadip Carlos Santana** and **Fred Catero**, with **Wayne Lewis** assisting. Also in the studio **Stacy Lattisaw** is laying down tracks for a Cotillion LP entitled *With You,* with **Narada Michael Wilson** producing and **Ken Kessie** engineering with assistant **Maureen Droney**. Down the hall, **Y&T** are recording their first album for A&M, with **David Seiff** and **Bob Schulman** producing and **Gary Lubow** at the console. *827 Folsom Street, San Francisco, CA 94107. (415) 7772930.* ■ **DIFFERENT FUR RECORDING** (San Francisco) **Walter Hawkins** is in tracking for a new album on Light Records, with **Melvin Seals** engineering and **Don Mack** assisting, while **Back In The Saddle** is recording a new single with **David Blossom** and **Karen Kirsch** producing and engineering. Also in the studio, **Hare Krishna** is mixing an album for Kirtan Productions with artist **Hansadutta**; production chores are being handled by **Andy Kandanes**, while **Vance Frost** and assistant **Howard Johnston** are behind the console. *3470 19th Street, San Francisco, CA 94110. (415) 8641967.* ■ At **FANE PRODUCTIONS STUDIO** (Santa Cruz) label mates **Bob Brozman** and **Michael Rugg** are finishing their newest albums for Kicking Mule Records, with **Pete Carlson** engineering and **Bob Force** producing Rugg. **The Citizens** are laying tracks for their forthcoming LP on DBC Records; Carlson engineering and producing. Also, roots Reggae rockers **The Rastafarians** have been cutting their second album, with **Fane Opperman** engineering. *115-B, Harvey West Boulevard, Santa Cruz, CA 95060. (408) 4250152.* ■ At **HEAVENLY RECORDING STUDIOS** (Sacramento) **Art Abodeely** is producing a new album for **Living Water** with **Larry Lauzon** engineering. **Billy Ford** is recording a new single with **Ray Pyle** producing, and Lauzon engineering. Also, **Carla Fulmore** has finished mixing his second album with engineer Lauzon. Heavenly has recently added a new MCI JH-110-B transformerless 2track recorder to its inventory. dbx noise reduction is used with both the 2track and their 24-track machines. *1020 35th Avenue, Sacramento, CA 95822. (916) 4285888.* ■ **HYDE STREET STUDIOS** (San Francisco) reports that **Chris Solberg** (Santana, Eddie Money) is in doing sessions with **John Cuniberti** engineering, while **Ray Gardner** is working on an album project with **Yves Gautschi** at the board and **Lou Casabianca** producing. Other projects include **The Rubinos** finishing 13 tracks with **Dan Alexander, Marc Wallner** and **Louis Barrer** engineering. *245 Hyde Street, San Francisco, CA 94102. (415) 4418934.* ■ AT **THE MUSIC ANNEX** (Menlo Park) **Lester Abrams**, co-writer of Minute By Minute, is producing four new tunes with engineer **David Porter**, while **Tower Of Power** is recording vocals with lead singer **Michael Jefferies**, produced by **Emillio Castillo**, with Porter at the console. In the other studio, **John Manson** is working on his second set of *Great Short Stories* for National Broadcast Syndication. Manson is coproducing with **Russ Bond**. *970 O'Brien Drive, Menlo Park, CA 94025. (415) 3288338.* ■ **VILLA RECORDERS** (Modesto) recently played host to **Merle Haggard** and **Rose Maddox** working on an upcoming album project, with **Allen Sudduth** engineering and **Mike Mellford** producing. *3013 Shoemake Avenue, Modesto, CA 95351. (209) 521-1494.*

Northwest:

☐ **WOMACH RECORDING STUDIOS** (Spokane, Washington), a division of National Music Service, announces the addition of **Hal Sacks** to their engineering staff. Sacks' background includes time with KSR Studios with clientel from Casablanca, RCA, and Sparrow, as well as work with other studios. Womach Recording Studios recently redesigned and expanded the operation to 24-track capability with a 1250-square foot music room. *East 122 Montgomery, P.O. Box 5378, Spokane, WA 99205. (800) 541-2671.*

Canada:

☐ **DARRYL GOEDE STUDIO** (Edmonton, Canada), formerly Machine Shop Studios, announces the completion of its newly redesigned Studio A control room, which features a Neve 8032 console, JBL, Auratone, and UREI 813 Time-Align™ monitors, and signal processing by Eventide, Neve, Marshall, dbx, and MXR. Mikes are by Shure, AKG, Sennheiser, Neumann, and Electro-Voice, and the studio offers a complete instrument selection. The new room was tuned with the aid of **Clive Alcock** of Allstar Sound, Ltd. Activity at the operation includes *Alberta Crude,* an anthology album for Ched-Am and Hurrah Productions, and **Nestor Pistor** in for RCA. The operation also runs a second studio for audio-video production, and commercial work. **Ray Lawrence** is chief engineer. *10528 108th Street, Edmonton, Alberta, T5H 2Z9, Canada. (403) 428-9141.*

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STUDIO UPDATE

Canada . . . continued —

☐ **THUNDER ROAD STUDIOS** (Calgary, Alberta) has announced the opening of their music/film complex. The recording studio houses a Neve 8108 console and Studer recorders in an environment designed by Tom Hidley of **Eastlake/Sierra Audio** and built by **Lakeside Associates.** A marble and glass isolation room augments the 2,700 square foot music studio. Eastlake/Sierra monitoring is also provided. The film mix studio also houses a Neve mixing console linked to 8-track M.T.M. film-mixing equipment. Sixteen- and 35-mm projection for screening of daily feature rushes, complete post sync facility (Foley) and a separate sound transfer suite are also available. *P.O. Box 212, Station J, Calgary, Alberta T2A 1P0, Canada. (403) 285-7625.*

☐ **CHALLENGER SOUND** (Richmond, B.C.) has now moved to a new location, where its facilities include two studios (16- by 21-foot, and 28- by 24-foot), with one control room (16- by 21-foot). The existing mobile has also been modified to act as a control room for the smaller studio. The main control room has JBL 4350 monitors, a Soundcraft 16-24 console, a custom Stephens 16-/24-/40-track recorder, an MCI JH-110A mastering machine and a Sony digital system. A good selection of Neuman, AKG, Shure, Calrec and PZM microphones are also available. The large studio and control room are designed with video/SMPTE capabilities. Studio designer was **Cal Woosnam**. *3580 Barmond Avenue, Richmond, B.C. VTE 1A3, Canada. (604) 274-7311.*

—ACTIVITY—

MUSHROOM RECORDING STUDIOS (Vancouver, Canada) finds **Doug & The Slugs** and **Loverboy** in trying out new material, while **Nancy Nash** is finishing up her new album with engineer **Rolf Hennemann**. Also booking time at Mushroom, **Lindsay Mitchell** of Prism is producing an LP for Capitol with performers **Annette Ducharme** and **Jamie Bowers; Keith Stein** is engineering. On the film side, recording has begun on an overture and nine tunes for a sciencefiction rock musical written by **Alan Dean Foster**, whose other projects include the script for *Star Trek — The Motion Picture* and the novelization of *Alien.* The plot concerns a musician whose guitar is a demon. *1234 West 6th Avenue, Vancouver, Canada, V6H 1A5. (604) 7341217.*

South America:

☐ **PHONOVISION INTERNATIONAL** (Bogata, Columbia) is a 10,000 square foot complex that features two studios, two control rooms and complete support facilities for the 24-track multi-media operation. Studio design was by **John Storyk**. The larger of the two music rooms can accommodate 30 to 40 musicians, and each control room features complete wrap-around vision in a "Phase-Coherent" design. Neve consoles are installed in each control room, which can comfortably host between 15 and 18 people. Above studio A is located a full video control room, offering complete video monitoring and camera capability. Current plans include addition of ¾-inch production and post production equipment for turning out promo tapes and video demos. Co-owner/engineer/producers are **Enrique Garviria** and **Mario Saraste. Bob Margouleff** served as construction supervisor. *Bogata, Columbia.*

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STUDIO UPDATE

Great Britain:

☐ **EDEN STUDIOS** (London, England) has installed the new Solid State Logic Master Studio System fitted with Total Recall, which allows artists to store every detail of their sessions between dates. Information retained includes stero foldback and monitor mixes, EQ, compression, limiting and gating. **Phillip Love** is the co-director of Eden. *20-24 Beaumont Road, Chiswick, London W4, England. (01) 995-5432.*

☐ **LONDON WEEKEND TELEVISION** (London, England) is taking delivery of a high-speed SMPTE locked, disk-based audio mixing console automation system. The new GT800 system is manufactured by Melkuist Ltd. of Great Britain, and will be installed in a Neve 36-channel custom-built dubbing console, located in LWT's new sound dubbing suite Number 2 in their South Bank Studios, London. Based on the Motorola family of MPU devices, including both M6809 and M6802 devices, the Melkuist automation system can be retrofitted into all makes of mixing board. In addition LWT has ordered an event control unit capable of controlling 32 simultaneous on/off events at up to 150 different points in time, related by SMPTE time codes. *London, England.*

American Samoa:

☐ **SAMOA/DAYSTAR STUDIO** (Pago Pago, American Samoa) is currently being built by **Jack** and **Donna Kime Barbre**, late of Daystar Recording, Joliet, Illinois. The new facility will feature a Neotek Series III console feeding an Otari MTR-90 24-track recorder. The studio is being designed by Jack Barbre, based on ideas developed by Jerry Milam, Brian Cornfield, and Randy Focht, among others. The live-end/dead-end concept is being incorporated into the design, which will result in a 30- by 35-foot control room, and large music room. The operation is located on eight acres of land with a view of the ocean 1/4-mile away. *P.O. Box 3933, Pago Pago, American Samoa, 96799.*

AUDIO/VIDEO UPDATE

☐When **Mickey Rooney** walked into **HI-FIVE AUDIO/VIDEO STUDIOS**, (New York), his only desire was to get top quality audio recordings of his new rock compositions. However when Hi-Five's President, **Moogy Klingman** (right), asked to video-tape the proceedings, the surprised Rooney was only too happy to perform for the cameras. Working under the bright lights, Mickey is said to have become so inspired that he wrote and recorded two new songs on the spot, while the cameras captured him at his spontaneous best. The pair are now huddled over potential video-disk deals for Rooney, the new rockartist; or as Klingman prefers to put it, ". . . the most powerful rock singer/songwriter to hit the scene since Dylan and Springsteen". *237 West 54th Street, New York, NY 10019. (212) 582-6414.*

Awards:

☐ This year's MIDEM Convention marked the introduction of special awards for **Music Videos.** The award for best International Promotional Video was awarded to London based **KEEFCO**, for *Babooshka,* starring **Kate Bush** and directed by **Kieth MacMillan. The Grand Prize for Video was won by David Bowie**, for his self directed video of *Ashes To Ashes.*

Video Releases:

☐ A **Paul Simon** concert, produced by **Michael Bannon** is due for release on both by **Pioneer Artists** (laser videodisk) and by **RCA Selectavision** (capactive videodisk). The concert was broadcast recently by Home Box Office (HBO).

☐ June sees the simultaneous audio and video release by **CBS Records** and **CBS Home Video** of *One Night Stand: An Evening of All-Stars.* The show, which was taped at New York's Carnegie Hall, spotlights the talents of **Eubie Blake, George Duke, Bob James, Herbie Hancock**, and **Ramsey Lewis.**

☐ Following its nationwide launch on March 22, **RCA's SelectaVision** videodisk catalog of some 100 titles contains five music-video presentations: feature films **The Harder They Come**, with **Jimmy Cliff**, and **Gimme Shelter**, with **The Rolling Stones; Eat to The Beat** starring **Blondie**, and **The Grateful Dead in Concert** (both of which were produced especially for the home video market); and **To Russia With Love**, an **Elton John** concert that was made originally for Pay-TV.

The Market:

☐ **The Electronic Industries Association** has gathered statistics through its Consumer Electronics Group showing a marked increase in home video sales. Consumer VTR machines sold to retailers in February of 1981 numbered 85,821 units, an increase of 56.1% from the same month a year ago. Sales of home video recorders during the first eight weeks of this year jumped 73.5% to 165,588 machines, compared to the 95,420 units sold during the same time last year. Sales to retailers of color television sets also increased, by 11.1 percent in February 1980, and by 24.2 percent for the first eight weeks of 1981 over the same eight weeks the previous year.

Eastern Activity:

☐ **BRAVO** (Woodbury, New York), a pay-cable television service for the performing arts, announces an April line-up that includes two full-length ballets performed by the **Ballet West Company** of Salt Lake City, Utah, and **One Night Stand: A Keyboard Event**, featuring **Eubie Blake**. The dance programs were video taped in the Capitol Theater, Salt Lake, and included the Salt Lake Symphony and Chorale performing the scores. was taped in conjunction with CBS Video Enterprises and offers Blake joined on stage by **Herbie Hancock, Hubert Laws**, and **Ron Carter**, among others. *100 Crossways Park West, Suite 200, Woodbury, NY 11797. (516) 364-2222.*

☐ **BROADWAY VIDEO** (New York City) has engaged **East Coast Video Systems, Inc.** to construct a new state-of-the-art post-production editing facility. The two editing suites will utilize the Sony BVE-5000 editor, BVH-100As, CDL 480 switcher with CAP, and dual-channel Quantel video effects. The machine room is built around seven one-inch VTRs. Audio for one of the editing room employs a Sound Workshop VCA-controlled board, interfaced with the editor. This provides the operator with direct control of the audio mixing process, without the use of external devices. East Coast Audio was formed by **Rich Bisignano** and **Paul Krucik**, both formerly staff engineers at JSL Video Services of New York City. *New York, NY.*

☐ **DEVLIN PRODUCTIONS** (New York City) has incorporated a two-channel stereo computer audio editor into its one-inch CMX Systems video editing facility. The operation now offers the ability to do computer edits on both tracks, simultaneously or one at a time. Revisions can be cut into each track independently as well. Activity at the post-production house includes the editing of a four-minute film starring **Bill Murray** and his brother **Brian Dole Murray** for *Saturday Night Live.* The film was shot in 16-mm by producer **Ted Haimes**, and then transferred to one-inch video tape on the Rank Cintel Telecine for subsegment editing and final presentation. The piece was directed by the show's film coordinator, **Mary Pat Kelly**. Devlin was also involved in mastering for the home video market **Bolshoi** and **Kirove Ballet** performances. **The Downtown Video Productions** shootings were transferred from 35-mm anamorphic color film to one-inch tape for mastering to Beta and VHS formats. The programs are the first of a series called *Kultur*, according to Downtown Video president **Gregory Leopold.** Other segments will feature **Andres Segovia, Artur Rubinstein**, and **Jascha Heifitz.** *150 West 55th Street, New York, NY 10019*

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☐ **COLUMBIA PICTURES** (New York City) announces the appointment of **Robert Blattner II** to the post of vice-president and general manager of **Columbia Pictures Home Entertainment**. He was previously director of sales for the home video division. *711 Fifth Avenue, New York, NY 10022. (212) 751-4400.*

☐ **E.J. STEWART VIDEO FACILITIES** (Primos, Pennsylvania) has just completed installation of a new Grass Valley Group MK digital video effects system, which allows the operator to call up an effect with the push of a button, and is said to eliminate the problem of picture chatter associated with digital video effects. Among the features offered are sliding picture, expansion and compression, mosaic effects, picture flips and twists, and strobe effects. A demonstration video cassette of the systems capabilities is available. **Richard Panure** has joined E.J. Stewart as director of program development, coming from a position with Northeast Productions. *525 Mildred Avenue, Primos, Pa 19018. (215) 626-6500.*

☐ **MATRIX VIDEO** (New York City) supplied its services to the Radio City Music Hall for the video taping of *A Rockette Spectacular*, starring **Ginger Rogers**. Six Bosch-Fernseh cameras were employed, under control from a mobile van parked outside the theater. Audio was mixed on a 24-channel panel in the Music Hall, with a six-channel sub-mix fed to the trailer outside where engineer **Aaron Baron** put together stereo and mono mixes for broadcast and release. Fernseh one-inch video recorders were employed for the program, which was produced by **Robert Jani**, president of Radio City Music Hall Productions. *New York, NY.*

☐ **PRO-VISION PRODUCTIONS** (New York City) has installed three 3M Model TT-7000 video tape recorders, two of which are equipped with 3M's Automatic Tape Following feature. Two NTC-10 time-base correctors were also added, according to Pro-Vision president **Gideon Fiat**. The tape machines were interfaced with a United Media Commander II editing system, and a 3M Model 3300 studio production switcher. *New York, NY.*

☐ **REEVES TELETAPE** (New York City) recently provided facilities for two *Live From Lincoln Center* telecasts for PBS. The first was a concert by **The Chamber Music Society** of Lincoln Center, featuring guest violinist **Itzhak Perlman**, and the second presented **Zubin Mehta** conducting the **New York Philharmonic** with pianist **Vladimir Askenazy**. Reeves production manager was **Cynthia Fuchs**, while Lincoln Center's **Kirk Browning** directed. **John Goberman** was the executive producer. Also Reeves, recently provided production and post-production facilities for a number of programs for the *Broadway on Showtime* series. **Bill Siegler** produced the tapings fro **Bob Rubin**, executive producer for Group W Cable Productions. *708 Third Avenue, New York, NY 10017. (213) 573-8600.*

Central States Activity:

☐ **SCENE THREE VIDEO** (Nashville, Tennessee), a new full service video tape production and post-production company, has begun operations, according to president **KITTY MOON**. A subsidiary of the house Scene Three, Inc., the company aims at producing "film style" productions on video utilizing such equipment as the CMX Systems 340X editor, Vital triple-reentry switcher, Squeezoom , a multi-channel digital effects device, and RCA 1- and 2inch video tape machines. Complete audio dubbing facilities are also availble. Emmy nominee **Terry Climer** assumes the post of chief enditor, with **Mike Arnold** acting as chief engineer. The company's in-house producer is **Mike Duncan**. *1813 Eighth Avenue South, Nashville, TN 37203. (615) 385-2820.*

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Central States Activity:

☐ **MUSIC VISION** (Austin, Texas) is a newly-formed subsidiary of Third Coast Video, designed to offer broadcast-quality video capabilities to music producers and musicians. The computerized 1-inch video tape facility will operate in conjunction with Third Coast Sound's 24-track automated MCI equipped recording studio, and 3,000 square-foot sound stage available for large productions. *501 North Interregional Highway, Austin, TX 78702. (512) 473-2020.*

Western Activity:

☐ **GOLD KEY MEDIA** (Los Angeles, California) a division of **Vidtronics**, is preparing a new music series, entitled *Portrait of a Legend*, to be hosted by **James Darren**. The series, to be offered on a barter basis, will feature video biographies of leading entertainers in the music business, and will utilize interviews, filmed performances and other clips; **Stevie Wonder** is the subject of the pilot episode. The first show in the series, to be aired in early June, will feature **The Beach Boys**, including an exclusive interview with **Brian Wilson**. *Portrait of a Legend* is being produced by **Scotti Brothers/Syd Vinnedge Television** and **Casey Kasem Productions**. *6671 Sunset Boulevard, Suite 1525, Los Angeles, CA 90028. (213) 462-6260.*

☐ **GOLDEN WEST VIDEO TAPE Michael Fierman** to the newly-created position of executive in charge of production. **Don Patton**, Golden West vice-president, says that Fierman will serve as a liason between production companies and the video facility, and will be responsible for servicing all client production needs. Golden West Videotape is a facility of Golden West Broadcasters. *5800 Sunset Boulevard, Hollywood, CA 90028. (213) 460-5500.*

☐ **INTERNATIONAL AUTOMATED MEDIA** (Irvine, California), as well as handling audio mastering, also offers a 40-channel, fully-automated audio and video rigged recording studio, video production and editing facilities, sound stages, concert production, record production and artist production services, as well as publishing. In the past the facility has been used by **Stevie Wonder, Donna Summer, Walt Disney, Kenny Loggins, The Beach Boys**, and **Jose Feliciano**. *17422 Murphy Avenue, Irvine, CA 92714. (714) 751-2015.*

☐ **PACIFIC ARTS VIDEO RECORDS** (Carmel, California) has been formed by Pacific Arts Corporation Chairman **Michael Nesmith**, shifting the emphasis of the company totally to video. **David Bean**, former marketing V.P. for Pacific Arts Records was named company president. Nesmith, whose video shorts recently aired on ABC's *Fridays*, is currently working on a full length video project exclusively for release through home video software. The work, entitled *Elephant Parts*, is currently taping in the Monterey area (see Feature Article elsewhere in this issue). Meanwhile, Pacific Arts has released their first home video program, starring **William Martin**, who recently appeared on NBC's *Saturday Night Live*. *An Evening With Sir William Martin* is being distributed on both Beta II and VHS formats by mail order and through video dealers. Videodisk options are being considered. *P.O. Box 22770, Carmel, CA 93922. (408) 624-4704.*

☐ **SNAZELLE FILM AND TAPE**, (San Francisco, California) has reached an agreement with Catalyst Productions that will add state-of-the-art video tape equipment and staffing capabilities to the operation. Catalyst will become part of the on-sight operation, according to president **Greg Snazelle** of Snazelle Film and Tape, Inc., and its subsidiary, Cine Rent West. *155 Fell Street, San Francisco, CA. (415) 431-5490.*

☐ **SYNOPSIS VIDEO PRODUCTION and SYNTHESIS** has moved from Santa Cruz, California, to Los Angeles. The facility has been involved in a number of video projects, including a video tape compilation of San Francisco New Wave bands with segments such as *The Residents*, *Tuxedomoon*, and **Rough Trade**'s *Cavert Voltan*. Synopsis also produced the first **Suburban Lawn** video promo, *Janitor*, and will be working with the band and their manager **Ike Eichelkraut** on future projects. **Dennis Gallant** made the announcements for Synopsis, whose equipment list offers an eight-level keyer-colorizer, external audio-video interface, complex and abstract pattern generation, strobe, sequencing, radiating rainbows, and image inversion. Video recording is of broadcast quality, with color gen-lock capability. *2128 Granville Avenue, Suite 5, West Los Angeles, CA 90025.*

☐ **TRANS-AMERICAN VIDEO** (Hollywood, California) has completed the pilot for *Not Too Late*, a late-night variety talk show video taped at TAV's Celebrity Theater. The studio offers complete production facilitites, including editing rooms and post-production services. *Not Too Late*, a Company III production in association with Polygram Television and the Program Development Group, is currently being edited at TAV. The show stars host **Jeff Meyer**, late of Minneapolis television, and features **Carol Wayne, Telma Hopkins** of Dawn, and **Jim Staahl** of *Mork and Mindy*. **Ron Wood** of The Rolling Stones made his first talk-show appearance in the pilot, directed by **Glen Swanson** and produced by **Carolyn Raskin, Toby Martin** and **Mort Liebov**. The program is intended for syndication through PDG/Polygram. *1541 North Vine Street, Hollywood, CA 90028 (213) 466-2141.*

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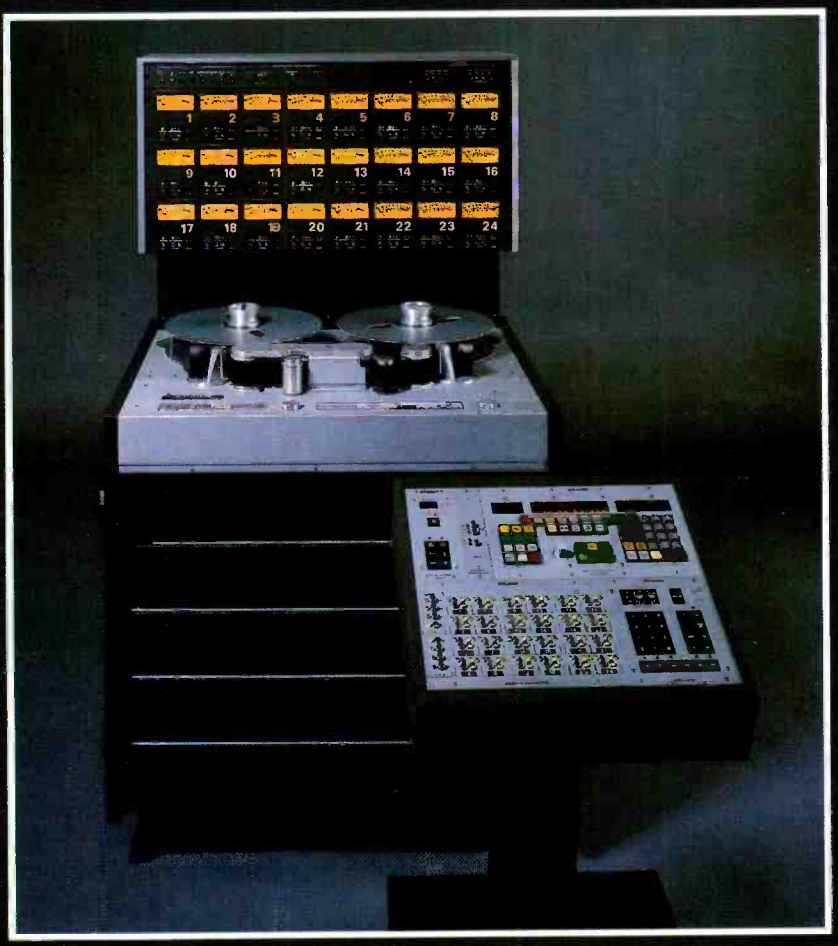

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