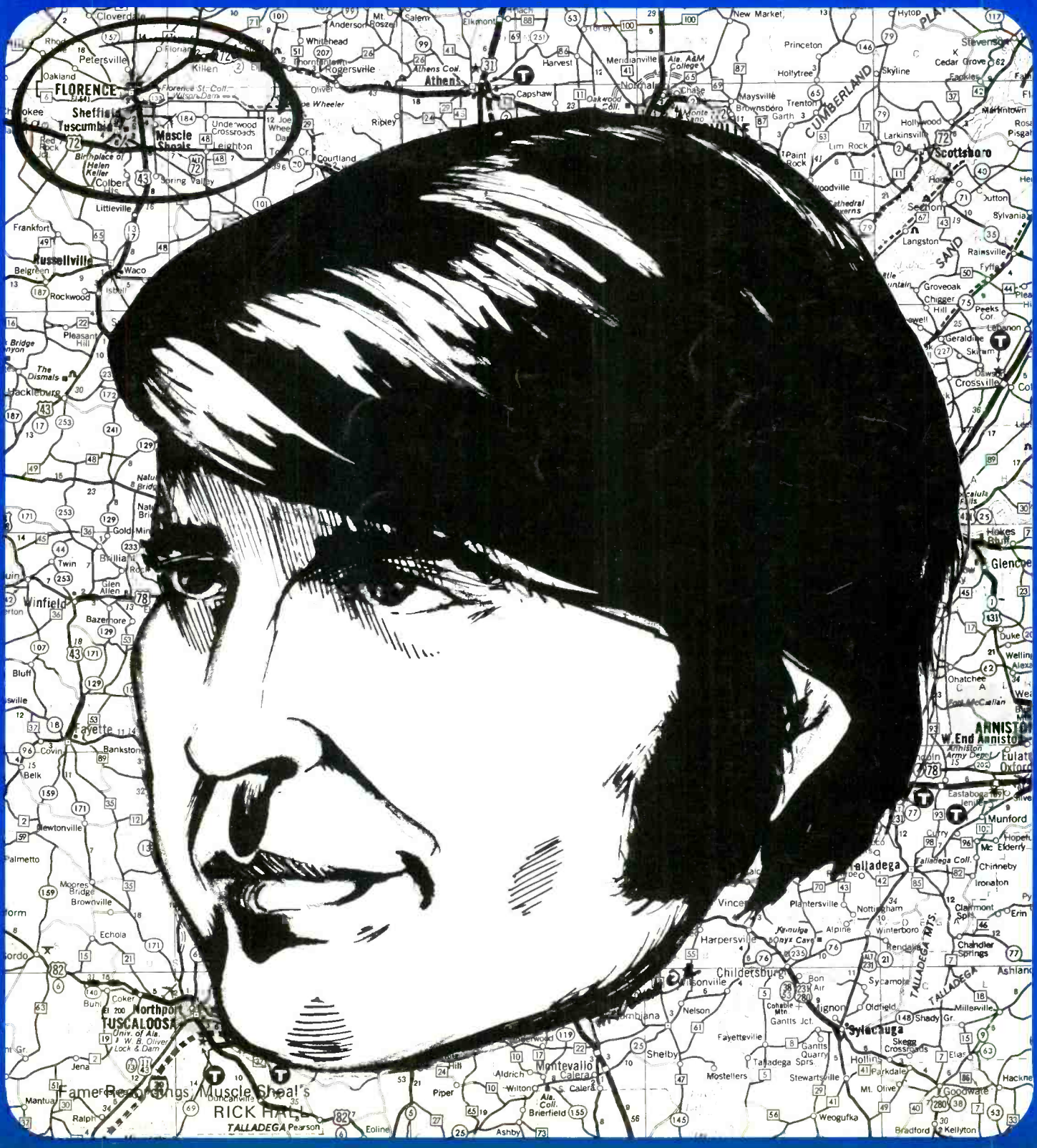
MARCH/APRIL 1972
VOLUME 3 – NUMBER 2
$1.00

RECORDING engineer/producer

relating recording science • to recording art • to recording equipment



Famed Recordings, Muscle Shoal's RICK HALL

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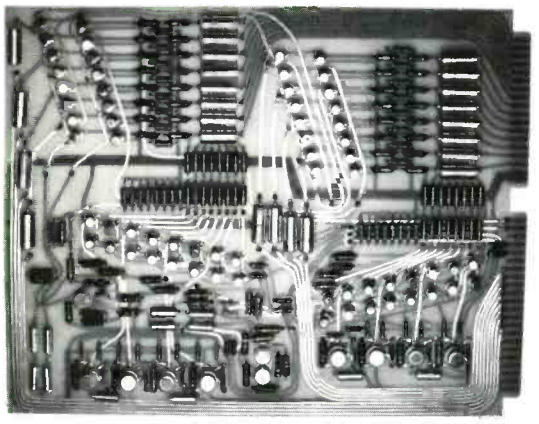

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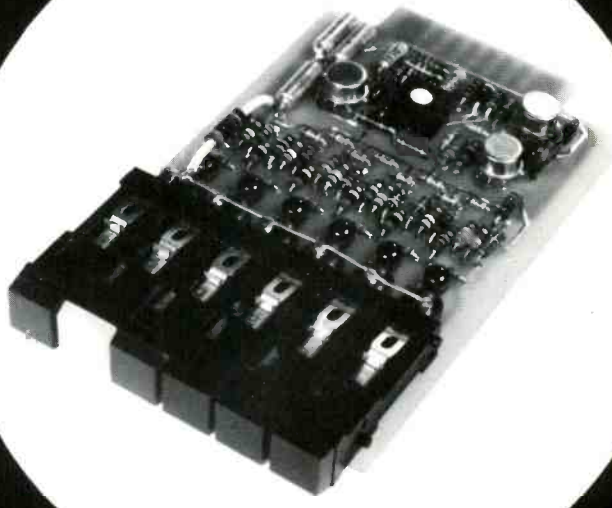

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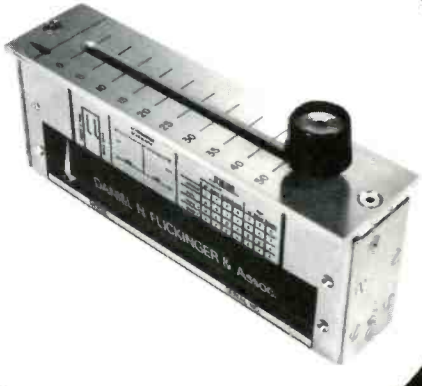

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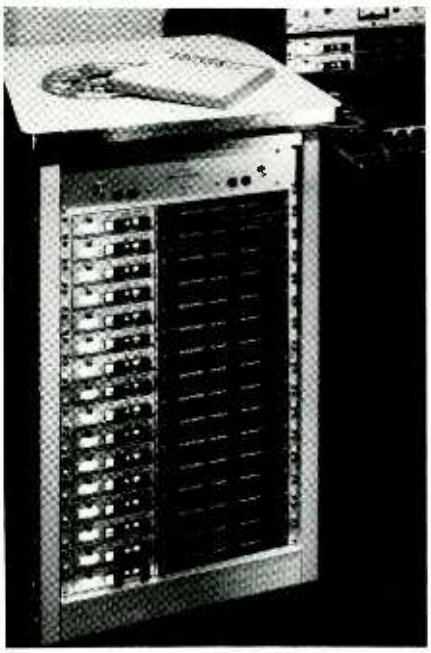

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MARCH/APRIL 1972
VOLUME 3 – NUMBER 2

RECORDING
engineer/producer

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–the magazine produced to relate . . . RECORDING ART to RECORDING SCIENCE . . . to RECORDING EQUIPMENT.

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cartoon: WAYNE YENTIS

LATE NEWS

6TH ANNUAL 'BYU' AUDIO RECORDING SEMINAR TO BEGIN JUNE 20 IN PROVO, UTAH; CONCLUDE JUNE 24 WITH 'HANDS-ON' DAY IN HOLLYWOOD.

In a dramatic move to greatly increase the traditional effectiveness of the annual Brigham Young University Audio Recording Seminar it has been announced that the 1972 course will include a 'special option;' a move to Los Angeles for a last day of hands-on experience in major Hollywood recording studios, after the first three days of preparation and lecture at BYU in Provo, Utah.

The 1972 program reflects a very heavy emphasis on 'Quad' Recording, with an outstanding array of audio and recording industry leaders assembled to conduct the historically successful seminars.

Among the discussion leaders will be Mr. Bert Whyte; Dr. Duane Cooper of Illinois University; United Recording Companies' President, Bill Putnam; Jim Cunningham of Chicago's Eight Track Recording Studio, Altec's John Eargle, and Bill Robinson of Hollywood's Sunset Sound Recorders.

Cost of the 1972 seminar is $110. This includes all instructional costs, but does not include food or lodging. If the registrant takes advantage of the 'special option' the Saturday in Los Angeles, the total cost of the seminar will be $200. This cost includes all instructional costs; transportation to Los Angeles; and one night's lodging.

Registration deadline for the seminar and 'special option' is May 1, 1972. The registration deadline for the seminar only is June 1, 1972.

Registration may be arranged or further information may be had by contacting Mr. Alton E. Sigman, Coordinator, Professional and Credit Programs, 242 HRCB, Brigham Young University, Provo, Utah 84601.

3M APPOINTS DEALERS FOR PROFESSIONAL AUDIO RECORDERS

Establishment of a geographic dealer network to sell and service 3M brand professional audio recorders/reproducers and accessories to the recording studio market has been announced by the Mincom Division of 3M Company.

The dealers will sell and service all 3M brand professional audio recorders and accessories including the 8, 16 and 24

k configurations. They will inventory a wide assortment of parts for rapid servicing for customers.

Newly appointed dealers are: Westlake Audio, Inc. (6311 Wilshire Blvd.) Los Angeles: Daniel Flickinger & Associates, Inc. (40 S. Oviatt St.) Hudson, Ohio: Gill Custom House, Inc. (8813 W. 95th St.) Palos Hills, Illinois: Automated Processes, Inc. (80 Marcus Dr.) Melville, N.Y. and Telephase Electrosystems, Inc. (595 Vandalia) Memphis, Tennessee.

RCA RECORDS ANNOUNCES COMPATIBLE, DISCRETE 4-CHANNEL DISC; FIRST RELEASE SET FOR MAY; PRICED SAME AS STEREO DISCS; REGULAR BUT SELECTIVE RELEASE PATTERN PLANNED BY FALL.

RCA Records, has announced the perfection of a truly compatible, discrete four-channel phonograph record, on which the company will release its first product in May. The disc will bear the same price as RCA's stereo records.

Eventually all RCA's new recordings will be compatible with both stereo and discrete four-channel playback equipment.

"This achievement puts the recording industry at the dawn of a new era," Rocco Laginestra, President of RCA Records ,said. "As long ago as last July, we announced that the discrete, four-channel disc would provide the consumer with the finest available sound, either on stereo or four-channel equipment and that it would provide the dealer with but one inventory. We now have the perfected disc, and I am happy we will be able to offer it to the market at the same price as our stereo recordings."

Laginestra also stated that over the next month RCA Records will be demonstrating its disc to other record manufacturers, hardware manufacturers and the press.

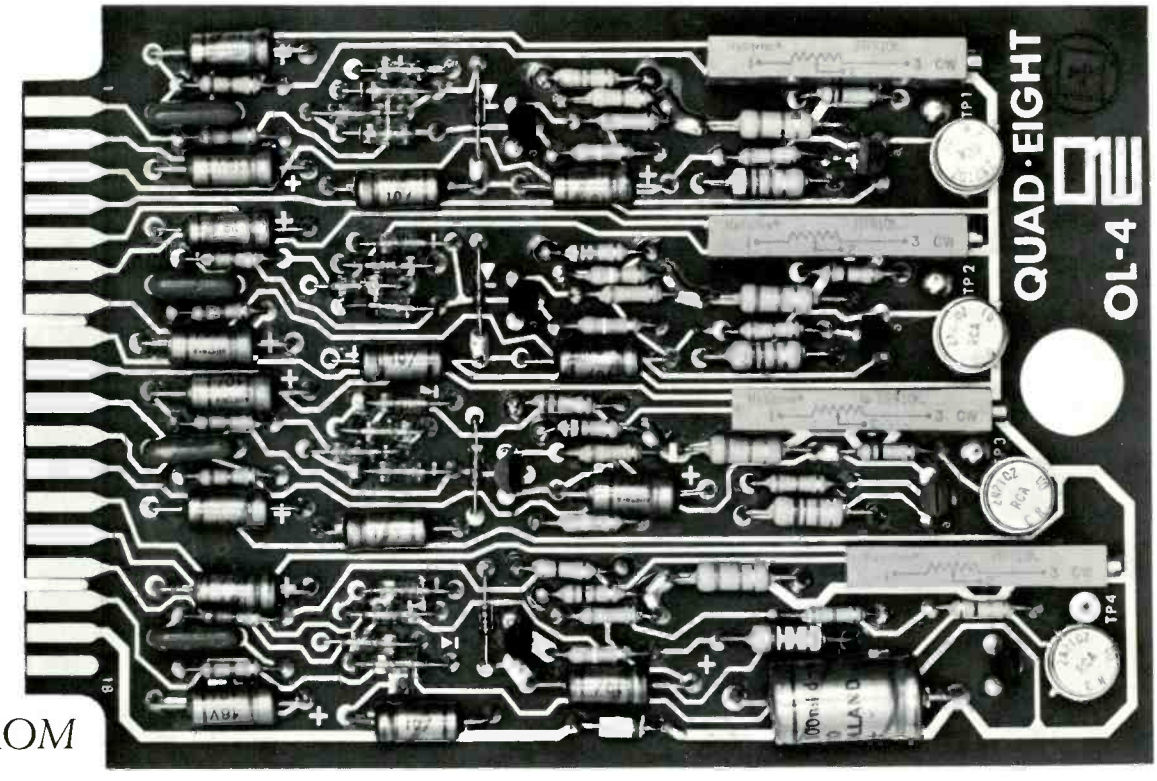
"At our progress report press conference last fall, I noted that the discrete disc gives the truest sound, permits the reliable reproduction of that which the musicians, engineers and producers intend, affords the proper mix and balance of sound, and permits the subtle location of the various instruments throughout the entire listening space," Laginestra said. "At that time, we had the sound. What we have achieved today is the other absolute requisite in our quest -- compatibility . . . one disc for everyone at the same price."

W.H. Dearborn, Director of Record Operations for RCA Records, said: "Our final breakthrough to success came as a result of (1) our use of a revolutionary new compound, involving a multiple resin system containing anti-static, lubricating stabilizer and other lubricants, which doubles the wear life of the product by reducing the carriers frequency deterioration during stereo playback and (2) the development of a more sensitive demodulator which enables four-channel playback with satisfactory separation and signal-to-noise ratios after the product has been played at least 100 times on a conventional, inexpensive stereo player with a conical stylus and 5 grams of pressure."

Dearborn said that one of the requirements of the four-channel disc will be the cutting of lacquers at approximately one-third the playback speed. "This will provide much better groove definition, particularly in the higher frequencies," he said.

In conclusion, Laginestra said: "The cooperation in this joint effort with Panasonic and JVC has been marvelous. Our achievement is a truly compatible, discrete four-channel disc which has none of the technological or price disadvantages of discs employing matrix systems. RCA Records stands ready to assist other software manufacturers to develop their own in-house, four-channel record production capability."

COMPONENTABILITY



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$100,000 ALTEC MOBIL SOUND LAB BEGINS NATIONWIDE AUDIO TRAINING TOUR.

The recently completed mobil sound lab, a self contained quad recording studio control room on wheels, is believed to be a 'first' in enabling a professional sound equipment manufacturer to demonstrate equipment and techniques to the nationwide market.

Altec contractors are inviting recording studio personnel, broadcast engineers, technical personnel from colleges and universities, architects and consultants to view and operate the various Altec products in a true operating environment.

Among the equipment being demonstrated is the new Altec Model 9300A recording console, and the 'bi-amped' Model 9846 monitor speakers; a new development in the evolution of monitor speakers.

Those interested in learning when the Mobile Sound Lab will be in their area can write for an itinerary to: Mr. Don Davis, Altec, 1515 North Manchester Avenue, Anaheim, California 92803,

From the READERS

An editorial material rating of the most useful feature article, as gathered from the Reader Service Cards received prior to press time.

JANUARY/FEBRUARY ISSUE:

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ELECTRONIC SOUL	18.10%
VCA'S	27.28%
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HASKALL/HALL/MALO

the MUSCLE SHOALS story... FAME RECORDING'S

RICK HALL

a Re/p interview by Ron Malo 'The Total Concept Sound'

Ron Malo: Rick, why did you come to Muscle Shoals to establish your operation?

RICK HALL: Well, I didn't have any choice. I really didn't come here. I was born and raised around this part of the country. So, when I couldn't break into the big time through Nashville . . . and I didn't have the money to get up to New York, I was forced to start my own little thing . . . get my own thing together here.

I had gone up to Nashville several times and tried to get something going, but I couldn't seem to get my foot in the door. Still, I believed in myself; I knew that I could cut hits . . . to be a success in this business you have to have an ego that tells you that you know you can produce hit records . . . so I just started bustin' my ass here in Shoals.

It's not where you are that counts. I think it's what you have going for you that's more important. Of course it was a hell of lot harder here than it would have been somewhere else. Like, if I could have had access to modern recording equipment, and a reasonable salary instead of $50 a week, and things like that. I probably would have been worth a million dollars ten years ago.

I have always had this kind of *'have to'* kind of feeling about this business. I always knew that I could cut hits, and now I don't think it's where you are that makes the difference, if you are really a good record producer. If you are a good record producer you can cut a hit record on a Wollensak.

Of course, it makes it a hell of lot nicer if you have 16 tracks to work with, and if you have great musicians, and great acoustics, and great echo chambers, and great arrangers, and all of the other goodies. But, it's been a long hard climb, and it wasn't really my choice because I had no choice but to be here.

Ron Malo: Some of your early hit records were cut on some pretty minimal equipment?

RICK HALL: Yea! The first hit record I cut, "You Better Move On" with Arthur Alexander, I recorded it on a Berlant recorder which cost $500 new. And the overdubbing was done from a Wollensak to the Berlant. We used a Fender Amplifier to power the speaker in the echo chamber. It was our bass amp, the one that we used for our gigs on the weekends. The echo chamber was the washroom in the building. I remember that the guy who owned the amp split with the thing one day, and for a while we didn't have any echo on our records.

Back then, all I had to record with was the Berlant, four microphones and a little Altec 4 channel mixer.

Ron: You record today pretty much as you did when you began with the limited equipment. Has your method of recording changed over the years?

RICK: Ya ! I really haven't changed my recording style that much even though now I have just about the best equipment here to work with. Back then, with only a few mikes and a few inputs I learned some pretty good lessons by trial and error . . . nobody taught me.

What I learned in those mono days seems to be pretty true even today . . . although, maybe my way isn't the best way; I don't know. But what I learned the hard way was that you had to know where you were going with the record and the artist. You had to start mixing way before you started the recorders. It took a lot more planning and thinking in the studio before you ever pulled any tape . . . because you didn't have a lot of the flexibility you have today with lots of inputs and 16 tracks.

The emphasis was on 'producing,' not on engineering. There wasn't much to the engineering then. I still feel that way. I consider myself first, second and third a producer; then fourth an engineer. While I want the best quality sound possible, from a technical standpoint, my first thought is *producing* hit records. I don't honestly think that sound quality is the most important thing. To prove it, we have had a good number of hit records that were less than perfect, engineering-wise.

Ron: Does this early experience relate to your practice of putting several instruments on a track, as you do, even when you are doing a 16 track date, rather than using one track per instrument, or even a couple of tracks per instrument?

RICK: Yes. It's probably a carryover from the early days. There are two things I try to do. First I try to keep everything very simple. Maybe more important, right from the beginning, I try to keep the record as much in proper perspective as I can. I try to record a rough mix as I go along.

I don't believe in just pushing up the controls and letting everybody play, filling up 16 tracks. The way I do it, mixing as I go along, when I'm done with the tracks I can put the master tape on playback, and set the levels, and I've almost got the mix right there. Then as I put horns and other things on, I can put them up in the places where they need to be loud; soften them up in places where they cover the singer, and so forth.

When you get 16 tracks filled up and you're trying to mix down 16 tracks at one time that seems to me to be the hard way to do it . . . unless the producer doesn't know which way he wants to go when he records the tracks . . . and he needs that kind of flexibility to put the thing back together. With 16 tracks it's also much harder to keep the natural perspective you set up in the studio. I always try to keep everything as simplified as possible.

As far as the tracks are concerned, if you look at my mixes, everything I cut will be in the same order. Tracks one and four will always be the rhythm. Bass and guitars on track one. Drums are always on four . . . sometimes with organ. The things I am sure of I always put on one and four. Sometimes if I want to isolate the organ, add a little more echo or add a few more highs, or if I am not sure I want to keep the organ at all I put it on track three.

Track two is always for the lead singer.

So, tracks 1, 2, 3, 4 will always be rhythm and vocal, and then there are plenty of tracks to spare for horns, strings, voices and the other special licks we might want to put on. We don't very often fill up all 16 tracks.

Ron: Do you record the band and singer at the same time?

RICK: What we do is to do the whole thing in phases. We cut the singer and the band track, which is usually four or five pieces, the rhythm tracks, together. Then we usually re-do the singer. The reason is that I want to relate the band to the singer. I like to have something to build the band around.

I'm not a guy who believes you can go in and cut a great band track without a singer on it. What sounded good as an instrumental track doesn't necessarily mean it's gonna sound good when you put the singer on. I don't see how you can know whether you have enough bass, or, say, too much drums without the singer in the studio. Some guys try to match the vocal to the rhythm tracks. The vocal is the most important thing on the record, not the tracks. So, what I like to do is put the singer in there and build the whole thing around him. So the band can play off the singer. They listen, they know when the lyrics are coming in; they know when to break, or when to roll in. That way the band can get the *groove* . . . the *feel* of the mix. With the singer in there I can get a pretty accurate idea of the balance of highs and lows, and the amount of echo.

Then, as I said, we usually re-do the vocal. I can let the band go home and really concentrate on the singer, put all the emphasis on the artist to get a cleaner track, get rid of bleed and leakage, clean up the diction. All we are looking for when the singer is in the studio with the band is the *feel;* the *groove.*

When just the artist and I are in the studio alone my job is to actually psych the singer into some sort of frame of mind or mood so that he can really do the number. You know . . . really make you believe it. That's a big part of cutting a hit.

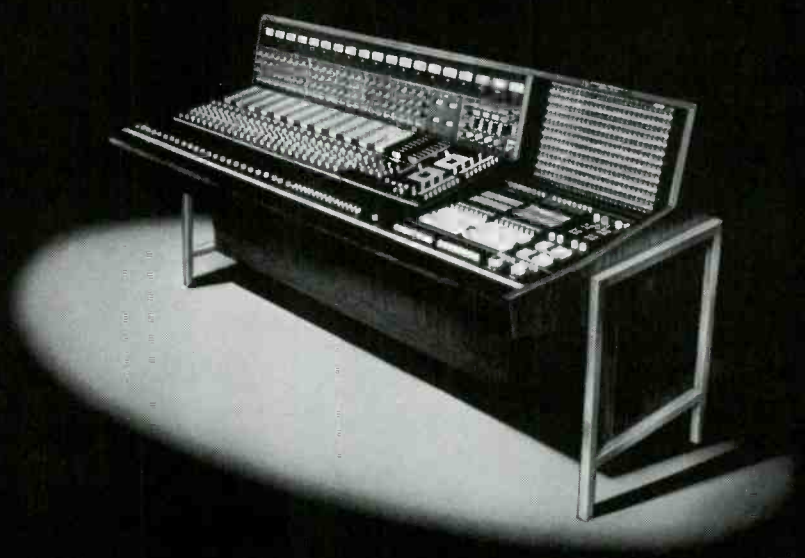
I want him, when he sings a sad song, he's got to be so sad, man, you get chill bumps on your arms. And, that takes a lot of work. But that's what you gotta have to make a hit.

Ron: Rick, would you like to be quoted on the thing you said downstairs about trying to make a performer a little more 'funky'?

RICK: Ya . . . I wouldn't mind being quoted on that. My philosophy on an artist is that you have to create a definite identity. Take the Osmonds. They were a very clean group; clean living, clean sounding, clean looking. So Clean the public didn't dig them as record identities. You know they were a great visual act long before I met them. And they were with Andy Williams on his TV show for seven years. They had all the movements, the schooling, the looks, the grooming . . . they were pros. But they needed a hit record. And the things they were singing . . . OH!

It was a question of changing their whole philosophy . . . giving them 'soul.' Now I'm going through the same thing with Mac Davis. I still think that he's a great song writer, but we've come up with some different approaches to cut a real big record on him, as I mentioned down stairs in the studio.

I always try to be as new, and as *today* as possible . . . I want to be *tomorrow* if I can.



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BEYER DYNAMIC

Circle No. 109

Ron: Is Country music *yesterday* or *today*?

RICK: I grew up Country; I had my beginnings in Country music, but that is not my thing at all any more. I am so far removed from Country that I don't even know what's number one, or number 20 in Country music any more. I never even look at the Country charts.

My feeling is that I like Country music; certain parts of it, and there are some great Country singers and great Country writers . . . some of the greatest writers in the world are Country writers. But, I don't think they get the ultimate out of a song. I think they go in with four or five guys, and the same lick they used on the last session is used on this session. In my opinion, they're never looking for new ideas and new approaches. So the Country thing is out for me. Country is 'yesterday.'

Ron: How about 'Soul'?

RICK: You speak about 'soul.' Soul to me is being true to the emotion of the thing . . . telling it like it is. Soul to some people is Black, but soul to me . . . when I say soulful, I'm saying . . . make me believe it.

If it's a sad song . . . you aren't singing it sad enough. Soulful to me is reality. Soul is an exageration, where Country is not. It's tough to really put it in words.

Ron: Is that the kind of thing you specialize in?

RICK: Yes! If there is anything that I try to stay close to in my records it's reality . . . 'soul.' I've learned that you have got to have a great performance from the artist and you have got to have a great band track, and a great arrangement, but the whole production has got to complement the artist and the lyrics of the song.

Mac Davis/Rick Hall

Ron: You mentioned 'mono' mix earlier. How do you monitor — mono or stereo?

RICK: My theory is this. You have got to have a hit single before you can have a hit album . . . in most cases. So, I never listen to stereo or mix in stereo until I mix the album. But let me say this, a hit single these days is not as important as maybe it was in the past. For example, a James Taylor, a Three Dog Night, people like that, you can go right in to cut an album. But with people who haven't had a top 10 or top 20 single before, going in to produce a hit album . . . well, you aint gonna spend that kind of money until you know that you've got a hit single. Some albums are cut as albums from the beginning. These, you go in thinking album. Other albums are made up as a collection of the artists singles. So there is a different situation. When you go in thinking album from the very beginning that means thinking, listening and cutting stereo. I guess you can say I'm a mono singles man.

When I am doing an album in stereo I do listen most of the time in stereo. Even there I still have a tendency to want to switch back to mono to get my bearings. Stereo fills up the room to such an extent that it over glamorizes a lot of things. Everything sounds better on the big stereo speakers. It's not as honest as listening mono on a little speaker.

But, when I am doing my mono things, I think it's a good idea to sometimes switch back to the big speakers just to see how much bass I am getting. When you listen on a little speaker you might think everything is cool because you won't really know how much bass response you have until you listen on the big speakers . . . and then you may find everything is 'boom boom,' and you have just got a big room full of bass. So there is reason for listening both ways . . . mono and stereo, and on big and little speakers.

Ron: You have been working and listening in this same room for a long time . . .

RICK: I've been cutting in this same studio for the past ten years. Even though we have replaced the equipment from time to time, the recorders, and now we are getting a new Flickinger board in here, and things like that, I have tried to keep basically the same studio and the same control room acoustically.

After 10 years your head gets adjusted, and your ears get adjusted to it, so the standard to me is what I know I am hearing here. It throws me for a minute, or so, whenever I listen in another room, but pretty soon I begin to relate that sound back to this room . . . just how the highs and lows relate. And then I know what adjustments to make.

Now, since we have got some hits I can't just sit down here in one room and do everything. You know, Ron, I come up to L.A. to have you guys put on some strings, and I go to Vegas sometimes for voices, but no matter what studio I am in I can always relate back to the original tracks we laid down here in Shoals.

Ron: Your control room is equalized, isn't it?

RICK: Yea! We have Dan Flickinger's — Lektracoustics system he calls it.

Ron: Then your studio is the standard that you can reference to, no matter where you go.

RICK: I'm saying that my tracks are what I want when I take them out of my studio. I can make the audio adjustment by hearing those tracks in any other studio.

Ron: Rick, can you tell us which microphones you like for various applications and why?

RICK: My favorite microphone, overall, is the Neumann U-87 and U-67 . . . and I prefer the '87 to the '67. But, there are certain situations where you have to have isolation and where you have to use more directional mikes. This means that you have to use different model microphones.

As far as I am concerned, with the bass drum and the bass, and things like that, you don't need to pick-up anything over 5kHz. So on the bass I use 2 (RCA) 44BX. The reason being that I don't pick up all the high cymbals and all the other high stuff around the room. I have no leakage on the bass. The same thing with the bass drum. I use inexpensive mikes, the EV654 on the bass drum.

I use a (RCA) 77DX with the horns and funky instruments like the baritone. You get a completely different sound than you would get with a U-87 or a U-67. The idea is to get right up on the mike with a trumpet and let him play real soft, and, man, you get a real *ballsy* big sound,

and you don't get that many highs. A lot of times I use a funky trumpet like that and I knock all the high end off and add low end to make it sound much bigger and much throatier. Bobbie Gentry's FANCY has a good example of that technique.

Using a baritone with the '77 you get a lot more balls on the record.

On the piano I use a (Neumann) KM 86.

For voices and on the lead vocal and guitars, with the exception of open (acoustic) guitars, although once in a while I do use them on open guitars, I use U-87's and U-67's.

Over the top of the drums I use an '87, too.

If I've got a percussion type situation where I want a lot of cymbals, or I want a special effect, I would probably put another mike on the drums . . . on the tom-tom or the cymbals.

I'm a funny guy, in that I don't think that drums are really a vital part of the record in most cases.

Ron: The drummer is really doing the balancing of the sound he produces?

RICK: Yea! You can tell the drummer what you want . . . play it a little louder or softer, up on the back beat . . . that sort of thing. I basically let the drummer play the dynamics I want to hear.

So, that's pretty much the story on the mikes I use.

Ron: Your records have a 'hot' sound. Do the musicians play loud on the session to get that sound?

RICK: To tell you the truth, I didn't used to be one that believed in letting the musicians play loud. But today, you have to relate with the times, and you have to change. So I believe that if you are looking for certain sounds, and there are certain groups who play those sounds, loud or soft, you can't ask them to change. Some groups just can't play soft and get a *feel.* So, now I just play it by ear. If the *feel* is in the studio, and I am not getting it in the control room, say the thing is distorting and overloading, then I start resorting to pads, isolation, side rooms, or leaving part of the instruments off until I get the basic thing; then I put the loud instruments on later.

My band (studio musicians) can play soft and get a loud sound. Maybe that's what you were referring to when you said my records have a *hot* sound. But especially with self contained groups, which do not need studio players, they are not quite as cool in the studio. You can go out and tell them to turn down, but the minute you walk back in the control room they are back up there again. There are times that I have my guys turn up real loud for some effect or other . . . So, I am not opposed to anything as a matter of principle, and I'm not a guy that believes that everything has got to be nice and clean cut for you to have a hit record.

Ron: You come up to Los Angeles to put strings on your records. Why?

RICK: L.A.'s got the best string players in the world, in my estimation. You've also got some of the best arrangers in the world out there. The reason is because of the movies, the players have been in Hollywood for years, and they use more strings than any other place in the world. Hollywood is a drawing card for the string arrangers and the players. New York used to be that way, but with the business the way it is a lot of the guys have moved to the West Coast. Also, L.A. is 'it.' There are more open minded people in L.A. because of the life style, I suppose. They are able to relate to what's happening today, more than the New York string players and arrangers. It's my opinion that in L.A. they are a little more flamboyant, a little more young at heart, and more willing to adapt to new music. If a hard rock group comes along, and somebody says he wants strings on a record, the guy on the west coast says, 'yea! that's a gas; let's try it.' He is not, like, well, man, you're crazy, strings don't belong on this.

Jimmy Haskell is probably the most progressive string arranger I have ever worked with. We have had a lot of success together. He is one of the fastest to come up with an arrangement. Pete Carpenter is also a great string arranger. Pete is a different kind of arranger, very sophisticated. You have to have different types of people for different type ideas. Today the good arrangers are not insulted if you want to change their charts after they have finished them. This is part of arranging for the *new* music.

Music is softening up again. It probably won't ever be like it was in the Glen Miller days. Look at your hits today, The Carpenters, James Taylor, these are very influential things.

That kind of stuff isn't done with head arrangements. I think soft orchestral music is coming on, and the hard music is starting to fade away. The more conservative kind of music takes a whole lot more 'producing.

Ron: You said you are a producer first and an engineer second. Do you want to talk about that?

RICK: That's exactly right. Fortunately I've been a mixer so I know some of the problems of a producer trying to get his point across to the engineer. More often as not it's a mind reading contest.

But, now, it's my opinion, producing is more important than engineering. Producing has taken over engineering. And, that's one reason why I don't let anybody else do my mixing . . . when I am down here, that is. As I said, I'm not the kind of guy who believes that you have to have an absolutely perfect record technically to have a super hit. But, you sure do have to have a great performance, a great song, great arrangements and great musicians . . . and a great mix.

Without meaning to criticize anybody, Producers have to know where they are going with a record. They have got to spend more time in the studio, planning and working with the singer and the band . . . not just sitting in the control room with the engineer laying down dry tracks.

Ron: How do you make your final mix?

RICK: Before I get into the final mix I listen to all the tracks and erase everything I don't dig . . . so that it doesn't pop up later and surprise me. I want to simplify all I can.

I'll make 3 or 4 mixes of each tune and put them on cassettes. I usually do that after I've laid off the session for a week or two. After I haven't heard the thing for a while I can get a better perspective of it. It's difficult for me to make judgments when I've been hearing the thing in pieces, over and over again, for weeks. When I'm fresh and not tired of it I can be more objective.

Anyway, I don't listen to those final mixes in the control room. I take them home with me and over the weekend, maybe on Sunday, I listen to them on my cassette player, not on big speakers, but on an ordinary cassette machine. From that I begin to get an idea, a perspective . . . what it does to me . . . the *mood* it puts me in . . . the *frame of mind.* That's what I go for in a record more than anything else; the *mood,* the *frame of mind.* By that time I have probably boiled it down to two of the four mixes.

Then I come in here on Monday morning and listen to those two mixes here in the office.

Ron: Not in the control room?

RICK: No! The control room to me; I get in there to listen and I'm back in an engineer's frame of mind.

No, I listen in here. This is my favorite room in the whole place for listening . . . it's more like a living room in a home, than an office. I've spent a fortune on the listening equipment in this room . . . it's absolutely flat. I make the final choice of the record up here where I can hear it like the people who buy it are going to hear it.

But, that's not to say that I won't hate all of the mixes when I begin listening. When that happens we go back to the master tape and add some things, erase other things . . . make 4 or 5 more mixes . . . and maybe do the whole thing over again.

Really, what I do is milk the thing. Keep changing parts, putting on, taking off, until I milk the thing dry. Then if I haven't got a hit record, then it just goes into the books that way . . . but I feel good that I did the best I could . . . I know honestly that I just can't cut a hit on that song. *END*

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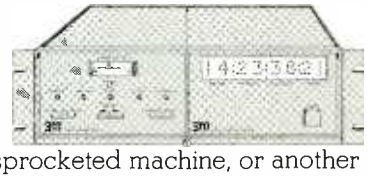

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RECOGNITION 1971

BEST ENGINEERED ALBUM *(NON CLASSICAL)*

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Engineers – DAVE PURPLE
RON CAPONE
HENRY BUSH
Producer – ISAAC HAYES
Studio – STAX – MEMPHIS

BEST ENGINEERED RECORDING *(CLASSICAL)*

BERLIOZ: REQUIEM

Engineer – VITTORIO NEGRI
Producer – VITTORIO NEGRI
Studio – (On Location, LONDON)

BEST ENGINEERED ALBUM NOMINATIONS

THE CARPENTERS

Engineers – RAY GERHARDT
DICK BOGERT
Producer – JACK DAUGHERTY
Studio – A & M – HOLLYWOOD

5TH DIMENSION

Engineer – BONES HOWE
Producer – BONES HOWE
Studio – (Live, CEASER'S PALACE, Las Vegas.)

STONES (NEIL DIAMOND)

Engineer – ARMIN STEINER
Producer – TOM CATALANO
Studio – SOUND RECORDERS – HOLLYWOOD

WINGS

Engineers – LARRY LEVINE
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Producer – HERB ALPERT
Studio – A & M – HOLLYWOOD

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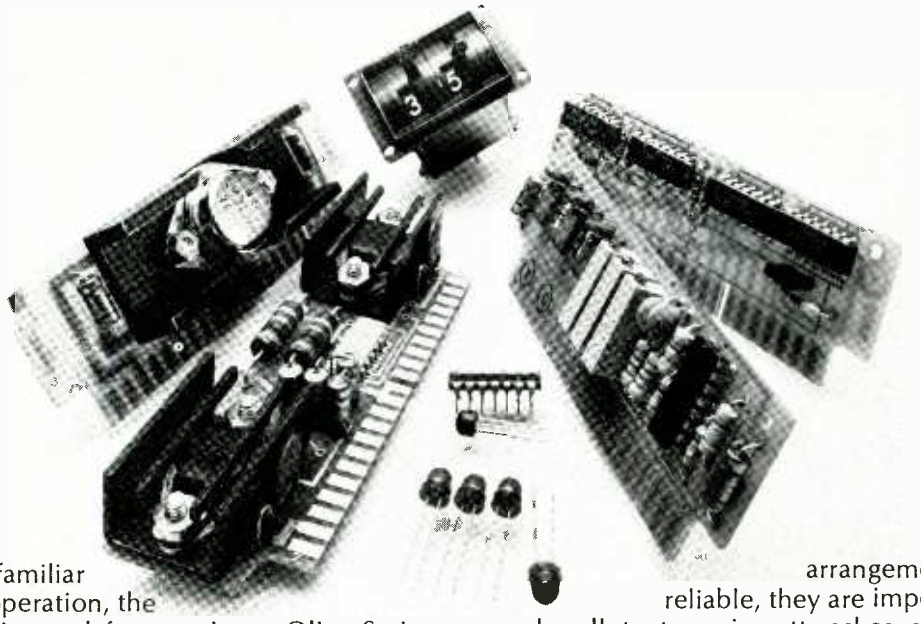

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Circle No. 112

RECOGNITION 1971

RECORD OF THE YEAR – 'IT'S TOO LATE'
Engineer – HANK CICALO *(CAROLE KING)*
Producer – LOU ADLER
Studio – A & M – HOLLYWOOD

ALBUM OF THE YEAR – 'TAPESTRY'
Engineer – HANK CICALO *(CAROLE KING)*
Producer – LOU ADLER
Studio – A & M – HOLLYWOOD

POP

VOCAL, FEMALE **'TAPESTRY'**
Engineer – HANK CICALO *CAROLE KING)*
Producer – LOU ADLER
Studio – A & M – HOLLYWOOD

VOCAL, MALE **'YOU'VE GOT A FRIEND'** *(JAMES TAYLOR)*
Engineer – BILL LAZARUS
Producer – PETER ASHER
Studio – SUNSET SOUND – HOLLYWOOD

VOCAL, DUO, GROUP OR CHORUS **'CARPENTERS'**
Engineer – RAY GERHARDT
Producer – JACK DAUGHERTY
Studio – A & M – HOLLYWOOD

INSTRUMENTAL **'SMACKWATER JACK'** (QUINCY JONES)
Engineer – PHIL RAMONE, JOHN CURCIO, TOM VICARY, GEO CLABIN (SOUND IDEAS STUDIO)
Producer – QUINCY JONES
Studio – A & R – NEW YORK

COUNTRY

VOCAL, FEMALE **'HELP ME MAKE IT THROUGH THE NIGHT'** *(SAMMI SMITH)*
Engineer – TOMMY STRONG
Producer – JIM AMLLOY
Studio – MONUMENT – NASHVILLE

VOCAL, MALE **'WHEN YOUR HOT YOUR HOT'** *(JERRY REED)*
Engineer – TOM PICK
Producer – CHET ATKINS
Studio – RCA NASHVILLE

VOCAL, DUO OR GROUP **'AFTER THE FIRE IS GONE'** *(CONWAY TWITTY / LORETTA LYNN)*
Engineer – OWEN BRADLEY
Producer – JIM WILLIAMSON
Studio – BRADLEY'S BARN, NASHVILLE

INSTRUMENTAL **'SNOWBIRD'** *(CHET ATKINS)*
Engineers – BILL VANDERVORT, TOM PICK
Producer – BOB FERGUSON
Studio – RCA NASHVILLE

R & B

VOCAL, FEMALE **'BRIDGE OVER TROUBLED WATERS'** *(ARETHA FRANKLIN)*
Engineer – GENE PAUL
Producer – J WEXLER, T DOWD, ARIF MARDIN
Studio – ATLANTIC – NEW YORK

VOCAL, MALE 'NATURAL MAN' *(LOU RAWLS)*
Engineer – ED GREENE
Producer – MICHEAL LLOYD
Studio – MGM – HOLLYWOOD

VOCAL, DUO OR GROUP **'PROUD MARY'** *(IKE & TINA TURNER)*
Engineer – BRENT MAHER
Producer – IKE TURNER
Studio – UA – HOLLYWOOD

JAZZ

SOLOIST – BILL EVANS ALBUM
Engineer – PETE WEISS
Producer – HELEN KEANE
Studio – COLUMBIA, NY

GROUP – BILL EVANS ALBUM
Engineer – PETE WEISS
Producer – HELEN KEANE
Studio – COLUMBIA, NY

BIG BAND – NEW ORLEANS SUITE *(DUKE ELLINGTON)*
Engineers – ROGER RHODES, ILHAN MIMAROGLU
Producer – DUKE ELLINGTON
Studio – NATIONAL RECORDING, NY

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RECORDING engineer/producer

Dear Martin:

I came across this article in the December 1915 issue of "Pearson's Magazine," and I find it to be a marvelous piece of record industry history. The article is slanted by the view point of the writer which, for me, makes it all the more interesting since it reflects the attitude of the time toward recording ...

Best regards,

Bones Howe

PEARSON'S MAGAZINE

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THE DEVIL AND THE DISK

By

Eugene Wood

A friend once asked me: "Everytime they make one of these records, do they have to sing the song all over again?"

They used to. It was a grand idea when they surrounded the singer with horns, six or eight of them, to make that many records all at once.

The beauty of the invention of making the record, not spirally on a cylinder but spirally on a disk, was that it was easy to make an electro of the original record and then stamp duplicates of it. At first they did that on wax. Later they devised another composition which is "wax to receive," when it is warm, and which if not "marble to retain," when it is cold, is at least something which lasts plenty long enough.

I saw the whole process of making talking-machine records from start to finish. It is practically identical with all of them, I suppose. I say "I suppose." The Victor people were very nice but they regretted that their rules forbade outsiders to be witness. The Edison people were very nice but they regretted that the fire which had wrecked their laboratory made it impossible to entertain me as a visitor. The Columbia people were very nice and invited me to call. After they had seen my open countenance — and heard it open — they were exceedingly gracious and hospitable, and took a lot of pains to explain things to me.

I didn't inquire, and I didn't want to know the recipes for making either the wax for the original record of the black shiny stuff of which the commercial records are made. These are secret compositions. Yes, indeed! In these days of analytical chemistry there is nothing so easy to keep a secret as the ingredients and proportions of a compound. I'm not an analytical chemist, but I have a nose. A good deal of a nose. I could spare some off the tip. And when I was in the factory and smelled the warm blanks ready for stamping, my nose said: "Tar roofing compound," or "black licorice," I won't be sure which. It may be one or the other or both or neither. To be frank with you I do not care what it's made of. That's *their* business.

It so happened that the artist I heard at the recording laboratory in West 38th Street was not a rag-time artist. I'm glad of that. I could live a long time without hearing any more rag-time. The singer was Mme. Margaret Matzenauer, of the Metropolitan Opera. We had a real nice visit together in between times.

The room is bare as can be. Everything wooden. Through a hole in the partition which shuts off the operators' room a horn sticks out. It is a plain cone of galvanized iron with a few half-inch holes in it. A platform brings the singer's mouth to the level of the axis of the cone.

The orchestra was huddled together, after the manner of a group photograph. The front rank sat on low chairs, the second rank stood, the third rank roosted on long-legged seats. All were bunched together except the brasses, who sat far back in the room, lest they should "blast" the record. The woodwind were right alongside the funnel, the strings in front.

They are regular orchestral instruments except the strings. True violins would not register except when held right in the funnel. A graphophone fiddle is all there except the sound-box with the graceful f-holes. A stout staff goes from fingerboard to the crutch at the player's shoulder. To this staff is bolted something like two metal saucers, edge to edge, or a hollow convex lens. From it a little horn comes out that the player may hear himself, and a bell like the bell of an alto saxophone, pointed at the recording funnel. The 'cello is shaped like a 'cello and that's all. The back and belly are stout half-inch planks, braced together like an iron bridge with lattice-work. There are no sides. The graphophone double-bass doesn't exist. To make a record the strings would have to be so thick, and strained to such a tension that it couldn't be played on. So a tuba substitutes. Let me say here that I have never heard so pure and smooth and evenly sustained a tone on that instrument as I heard that day. Even so, no embouchure of the tubist can be as nimble as the fingers of the contrabassist. In rapid scale-passages in orchestral works, the 'cello part has to be doubled but no 'cello can sing as low a note as the contrabass.

When Mme. Matzenauer came to a high note, she leaned away back from the funnel; the clarinetist swung away when he produced a tone from the bell of his instrument; whenever any of the woodwind made a note by opening a vent near the axis of the funnel he turned aside. This must be done so as not to "blast" the record or have one tone stick out like a sore thumb.

At a high desk perches Prince, the conductor. The orchestra goes over the piece to rehearse it for the tempo the singer wants. Then the singer gets up on the platform in front of the receiving horn. A red light flashes, the conductor's little stick raps twice – they're off! This record is played over for the singer and the conductor to hear. The playing destroys it. It happened to be Tosti's "Aprile." It suited Mme. Matzenauer but the conductor said: "No. No. The sustained tones that the other instruments have are all right, but the harp doesn't come out enough. Charley, can you play that louder?"

So Charley played it louder on the repeat. "No. That won't do, either. It still doesn't come out clear enough. Can't hear anything but the sustained tones. Try it again. Charley, you sit here. Adolf, you'll have to move over there, and Emile, you'll have to go where Adolf was. Once again,

now." Rat-tat! This time there was too much harp. Another shift. All over again. That was nearer but not quite it yet. Try it again. Like that. That's about right. Now we'll make the record. Once more the beautiful river of tone flows on, the harp making moonlit ripples on the moving tide, and the singer's voice, above all, like a tall and stately ship. Just about four measures from the end, the singer's voice, which had attacked each tone so purely, so neatly, each one like the angle of a rich-hued ruby – a tiny drop of phlegm upon the vocal cords, a tiny, tiny one; in the opera it could not have made its roughness heard – she gave a despairing look at the conductor. He pressed his lips together and shook his head. "Too bad. Have to do it all over again."

Well, that's how it goes.

But the next time it was faultless. I couldn't have done better myself. I told her so as she signed the soft wax with the stylus. She seemed so pleased!

Inside the operating room the receiving horn at its little end had a vibrating diaphragm to which was attached a sapphire graving-tool, which plowed a tiny furrow. On the turn-table lay the recording disk of wax, about an inch thick, kept till needed in a refrigerator warmed by electric lamps to about 100 degrees. The disk is a beautiful thing. So polished and smooth and luscious-looking! I wanted to bite it.

As the graving-tool fed across its surface, a tiny, flossy, curly shaving of wax skeined and tangled itself like a cobweb. I took some of it and put it in an envelop so as to show it. But when I came to show it there was nothing to show.

At the factory in Bridgeport, this wax disk is dusted with graphite and then polished by the intelligent palm of an expert till you could see to comb your hair in it. The graphite covering makes it possible to make an electrotype of the disk in baths of copper sulphate blue and clear as a sapphire. It comes out looking like a brand-new copper pie-pan with a wax pie in it. From that electro other "stampers" are made by the same process, with which to press the engraved autograph of the sound upon commercial records made out of black licorice or tar-roofing compound, or whatever it is.

This stuff has to be ground very, very fine and rolled and re-rolled till it isn't the least bit lumpy. When the very widest wiggle in the autograph of the sound is only 6-1,000 of an inch, it isn't well to have pebbles or even grains of sand in it. Warmed to 175 degrees, each of these black licorice blanks is put between stampers and squeezed by hydraulic presses to the tune of from 16 to 18 tons.

In Mr. Edison's patent papers he talked about making copies of records by taking plaster-of-paris casts. (Don't laugh.)

While these stamped disks are being trimmed, cooled, polished, labeled and all, they are scanned by eagle eyes for scratches and flaws, and smashed into bits if they show any. Every twenty-fifth disk is played over for defects too small to see. If it is bad, its twenty-four predecessors go into the scrap-heap.

I had an idea that the raw material was of little worth, but when I saw how carefully the bits of broken disk were saved up to be ground again, I changed my mind.

The recipe for the black stuff varies, according to the season of the year, and according to the climate of the place where it is made. For not only are they made in every language spoken by enough people to constitute a market, they are also made on the spot. And for the spot. *Tristes* (the South American equivalent for the "come-all-ye" and the "cowboy's lament"), which the people of Chili listen to with rolled-up eyes, are coldly regarded in the Argentine or Peru. The operatic performances which the Cantonese hear with joy unspeakable – they sound to me like

someone falling downstairs with the tea-tray, breaking his shins and squalling lamentably — don't get over with Pekinese at all. Not only are there records in all the languages of the civilized world — which is now engaged in murder, wholesale and retail, except those nations which are earnestly looking for an excuse to get into the game — there are also records in the four principal languages of China, in Japanese, Havanese, Hindustani, Arabic, and some American Indian languages.

How many records are there in the whole world?

Mr. Burns, vice-president of the Columbia folks, made a guess — mind you, it's a guess — that all the record-making establishments, big and little, must turn out every working day between a quarter of a million and half a million copies. Since they're all behind on their orders, that would mean 300 working days a year, or between 75,000,000 and 150,000,000. Allowing that a record will live five years—oh, why not say there are a billion records in the world? A billion sounds so rich.

Kind of wonderful, isn't it, for a comparatively young business?

Dealings with the Devil on the Disk, it is my prophecy, will be found to be as epoch-marking as Dealings with the Devil and Dr. Faustus on the printing press.

Think of what an educating influence it is bound to have! Those who had no other way of forming their musical tastes than by the ministrations of Dinny Lynch's String Band (two fiddles and a guitar with a mouth-harp attached; leave orders for dance engagements at the Laundry) now can hear the world's great orchestral works performed by first-rate organizations. The naturally beautiful voices which fairly speckle this country, did we but know it, now have for model and example, not Levi Curl leading the choir with his, "Down, left, right, sing," but the greatest singers of the world. One may live in a remote and forgotten hamlet and study a foreign language with the correctest accent. One might even learn to speak good English; it's not improbable.

And if, as most magazine editors and theatrical managers believe, there is nothing the American public will run faster from or farther from than anything that tends toward enlightenment and improvement of the mind — they were all fed up with that high-brow stuff in school, don't you see? — why, then think of the fun you can have with a talking-machine in the house, the band to play for dancing, the latest popular song which to-day is and to-morrow is cast into the oven, and talking records you'd die laughing at — "Cohen at the Telephone" has sold over a million copies.

It's wonderful already and it's just begun.

You have your own private imp shut up in the box, obedient to your command, and not having to make incantations at midnight with a candle made of hare's fat.

Of all enchantments, of all magic, white or black, there is one result we so much long for that we are willing to face even the Devil himself to get it. And that is, to hear again the voice of one we loved and lost. There is none but sympathizes with poor, hard-beset Saul when he evades his own law and begs of the witch of Endor: "Bring me up Samuel." You may remember how, only a few years ago when records were wax cylinders, sometimes at the end there would be a vacant space of wax which could receive as well as reproduce, and after the band had finished a voice would bawl: "George is here. George, you come talk into it." And George would say something. Trivial though the words were, rollicking though the tune that went before it, yet that record is now something solemn and sacred, for not long after poor George was killed in a railroad accident. Yet there's his voice. "Being dead, he yet speaketh."

By the way, that's a new department just established, personal records. You pay so much for a "master" from which you can have copies struck off, as many as you like. I should think that would make a nice Christmas present to send to friends. More than that, it would be a prized memorial.

If we could have Lincoln's own voice pronouncing the Gettysburg oration! What a treasure! Well, we could have had all that and more five hundred years ago only for one thing.

About two thousand years ago arose an institution which exterminated scientific inquiry as relentlessly as body vermin. Worse, it cultivated and admired body vermin as intensely as it feared and hated scientific inquiry. While it had teeth and claws to fight with it fought with a wildcat's fury all "novelties" (novitates) and everything that had not been known and believed, "always, everywhere, and by all men." It was a bitter partisan not of the Devil but of the – the Other Party.

In matters natural this institution has been proved to be so utterly in the wrong that many are beginning to ask if it may not be quite as wrong in matters supernatural. Can it be, do you suppose, that all these years we have been taught to honor and respect the wrong party? To fear and hate the wrong party?

There's only one way to tell that I know of, and that's the rule of a Friend of mine: "By their fruits ye shall know them."

Take twenty centuries of devotion and respect and honor and submission to the Other Party. Count up the fruits of ignorance of the Processes of Nature. Then take the last twenty years, in which most particularly the Devil has had his dues, this Spirit I that evermore denies what pastors and masters and all those set in authority over us, all of them, everywhere and always have proclaimed; this serpent that puts us up to eating the apple of the Tree of Knowledge, that puts us up to prying into mysteries that we may imitate creation and even improve upon it, promising us that we shall be as gods, flying about in the air, living under water, removing mountains, uniting oceans that the Other Party had separated . . . . . .

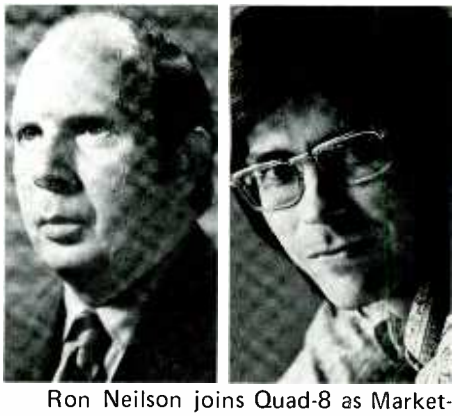
Well, what do you think? How do the fruits of the last twenty years compare with the fruits of the last twenty centuries?

EUGENE WOOD
PEARSON'S MAGAZINE
DECEMBER 1915

WINDSOR AND NEILSON JOIN QUAD–8

As announced by President Robert Bennett of Quad-8 Electronics, William E. Windsor has joined the company as Vice President and General Manager. For many years active in various east coast studios, Windsor has been chairman of the New York section of the Audio Engineering Society.

Windsor *Neilson*



Ron Neilson joins Quad-8 as Marketing Director, after having served in marketing and design functions with other audio equipment manufacturers.

Both men will seek to expand the Quad-8 capability from complete audio systems design and manufacture to include a comprehensive component line.

Scully would like to clear the air of the pollution you've been hearing.

Recently, we announced that the Scully Division of Dictaphone Corporation was moving its manufacturing facilities from Bridgeport, Connecticut to Mountain View, California.

Apparently, the reason for our move has caused some confusion in the recording industry which we would like to clear up.

The move was necessitated for one simple reason.

Sales of Scully/Metrotech professional recording equipment in 1971 were the highest in our history, and we had to expand to larger quarters in order to meet demand and maintain quality.

So in addition to our new manufacturing, engineering, and research facilities in Mountain View, which are more modern and much bigger, Scully will also maintain four regional offices in Los Angeles, New York, Chicago and Nashville. And we're expanding even further with representatives in Dallas, Washington, D.C., Toronto and London.

For more information about our new facilities, please feel free to write to us. In fact, by all means write to us.

Scully/Metrotech

Divisions of the Dictaphone Corporation, 475 Ellis Street, Mountain View, California.

Circle No. 118

AUDIO ENGINEERING SOCIETY

Forty Second Convention . . . Exhibition of Professional Products . . .

Mezzanine, Los Angeles Hilton

REGISTRATION

Monday,	May 1 — 1:00 to 5:00 P.M.
Tuesday,	May 2 — 8:00 A.M. to 8:00 P.M.
Wednesday,	May 3 — 8:30 A.M. to 8:30 P.M.
Thursday,	May 4 — 9:00 A.M. to 5:00 P.M.
Friday,	May 5 — 9:00 A.M. to 5:00 P.M.

Recording Workshop — 7:30 P.M. Registration at the door

EXHIBIT HOURS

Tuesday and Wednesday, May 2 and 3 — 1:00 P.M. to 9:00 P.M.
Thursday and Friday, May 4 and 5 — 11:00 A.M. to 5:00 P.M.

DEMONSTRATION ROOMS

Foy, St. Louis, Dallas, Hartford, New York, Buffalo, Boston, Detroit, Washington, Cleveland, Mission

TECHNICAL SESSIONS

Golden State Room: Sessions A, C, D, E, F, G, J, K, M
Los Angeles Room: Sessions B, H, L

AUDIO ENGINEERING SOCIETY EXHIBITS

	BOOTH Nos.
AGFA-Gevaert Inc.	98
AKG Microphones, North American Philips Corporation	70/71
Allison Research Inc.	117/118
Altec	Mission
Ampex Corporation	Stage
Audio Industries	64A
Audio/Tek, Inc.	102
Automated Processes, Inc.	87A/88
B & K Instruments, Inc.	55
The R.T.Bozak Manufacturing Co.	76
Burwen Laboratories	Buffalo
California Switch & Signal	49
Cerwin-Vega	101 and Boston
Crown International	53/54
The Custom Fidelity Company, Inc.	60
Dolby Laboratories, Inc.	125/126
Dukane Corporation	Dallas
Duncan Electronics Company	48
Electro/Sound, Inc.	74/75
Electro-Voice, Inc.	New York
Eventide Clock Works	101A
Daniel N.Flickinger & Assoc.,Inc.	87/100
Gately Electronics	52
Gotham Audio Corp.	92/93/94/95
Harvey Radio Company, Inc.	122
Infonics, Inc.	115
International Telecomm Inc.	70A
IVC America, Inc.	Washington
Koss Corporation	56
James B.Lansing Sound,Inc.	Foy/St.Louis
Lipps, Inc.	99
Maxell Corp. of America	50/51
MCA Technology, Inc.	129/130/131
Muggs Music, Inc.	63
Multi-Track, Inc.	91
Nigra Magnetic Recorders, Inc.	62
Rupert Neve Incorporated	119/120
Nippon Columbia Co., Ltd.	Hartford
Olive Electro Dynamics	113/114/114A
Otari of America, Ltd.	64
Pacific Recorders & Engineering Corp.	104
Pentagon Industries, Inc.	100A
Pratt Sales Corporation	61
Protronics	59
Quad-Eight Electronics	72/73
Revox Corporation	124
Sansui Electronics Corp.	Studio
Scully/Metrotech, Division of Dictaphone Corp.	103
Sennheiser Electronic Corp.	77
Shure Brothers, Inc.	121
Spectra Sonics	132
Stanton Magnetics, Inc.	116
Strom Communications Corporation	Detroit
Superscope, Inc.	127/128
Systron-Donner Corporation	48
Taber Manufacturing & Engineering Company	89
TEAC Corporation of America	96/97
3M Company	78 — 81A
TOA Electric Co., Ltd.	58
United Recording Electronics Industries	90 and Cleveland
United Research Laboratories Corp.	123
Westlake Audio, Inc.	107 — 112
Westrex	105

Monday, May 1
Welcoming Cocktail Party
5:00 — 7:00 P.M., Studio Bar

SESSION A
MAGNETIC RECORDING AND REPRODUCTION

TUESDAY, MAY 2, 9:30 A.M.
GOLDEN STATE ROOM

A-1 THE EFFECT OF CONDUCTING GAP SPACERS ON THE IMPEDANCE OF MAGNETIC HEADS

A-2 THE CAPABILITIES AND APPLICATIONS OF A PORTABLE TWO TRACK ¼-in TAPE STEREO RECORDER

A-3 THE APPLICATION OF CHROMIUM DIOXIDE TAPE TO AUDIO RECORDING

A-4 A VARIABLE SPEED CAPSTAN MOTOR DRIVE FOR PROFESSIONAL TAPE RECORDERS

A-5 RECORDING ASPECTS OF MAKING A ROCK FILM

A-6 MASTER-TAPE EQUALIZATION REVISITED

A-7 A SIMPLE SPEED CONTROL SERVO USING A MONO-STABLE REFERENCE

SESSION B
AUDIO INSTRUMENTATION AND MEASUREMENT

TUESDAY, MAY 2, 9:30 A.M.
LOS ANGELES ROOM

B-1 AN OBJECTIVE METHOD FOR PRODUCTION TESTING THE ELECTRO-ACOUSTIC PERFORMANCE OF TELEPHONE TRANSMITTER AND RECEIVER CAPSULES

B-2 THE PORTABLE TAPE RECORDER AS AN AUDIO INSTRUMENTATION DEVICE

B-3 THE DESIGN AND USE OF A SIMPLE PSEUDO RANDOM PINK NOISE GENERATOR

B-4 LOUDSPEAKER INSTRUMENTATION

B-5 SIMPLIFIED CALCULATION OF LOUDSPEAKER LOW FREQUENCY RESPONSE USING ANALOG CIRCUITS

B-6 MEASUREMENTS OF AUDITORIUM ACOUSTICS WITH A STORAGE OSCILLOSCOPE AND TONE BURST GENERATOR

B-7 A WIDE-RANGE ELECTRO-STATIC MICROPHONE CALIBRATION SOURCE

B-8 A COMPUTING NOISE MONITOR FOR ACCELERATED MEASUREMENT OF ENVIRONMENTAL NOISE

B-9 I.M. DISTORTION TESTING IN AUDIO EQUIPMENT

SESSION C
DISC RECORDING AND REPRODUCTION

TUESDAY, MAY 2, 2:00 P.M.
GOLDEN STATE ROOM

C-1 OPTIMIZING THE WESTREX STEREODISK SYSTEM
C-2 DISCRETE-MATRIX MULTI-CHANNEL STEREO
C-3 ON THE REPRODUCTION OF DISCRETE 4-CHANNEL DISC "CD-4"
C-4 WHY STRAIGHT LINE PHONOGRAPH ARMS?
C-5 DESIGN OF A HIGH POWER CUTTING AMPLIFIER

SESSION D
ELECTRONIC MUSIC

TUESDAY, MAY 2, 7:00 P.M.
GOLDEN STATE ROOM

D-1 COMPUTER GENERATED ELECTRONIC LIGHTING SYNTHESIS.
D-2 COMPLEX SOUNDS FROM SUBTRACTIVE SYNTHESIS: SOME PRACTICAL MEANS
D-3 CREATING COMPLEX TIMBRE THROUGH THE USE OF AMPLITUDE MODULATION IN THE AUDIO BAND
D-4 A COMPUTER-AIDED ANALOG ELECTRONIC MUSIC SYSTEM
D-5 THE COMPUTER AS AN AID TO THE COMPOSITION AND PRODUCTION OF COMMERCIAL MUSIC
D-6 A HIGH-ACCURACY FREQUENCY SHIFTER FOR PROFESSIONAL AUDIO APPLICATIONS

SESSION E
SOUND REINFORCEMENT

WEDNESDAY, MAY 3, 9:30 A.M.
GOLDEN STATE ROOM

E-1 MODEL RAILROAD SOUND SYSTEM
E-2 NEW TECHNIQUES FOR SOUND SYSTEM EQUALIZATION
E-3 REMOTE EQUALIZATION OF SOUND SYSTEMS
E-4 IN-SITU MEASUREMENT AND EQUALIZATION OF SOUND REPRODUCTION SYSTEMS
E-5 SOUND REINFORCEMENT SYSTEMS AT WALT DISNEY WORLD
E-6 CHARACTERISTICS OF PRACTICAL "INFINITE LINE" LOUDSPEAKER ARRAYS IN SOUND REINFORCEMENT SYSTEMS
E-7 AN AUDIO DELAY SYSTEM EMPLOYING ANALOG SHIFT REGISTERS

SESSION F
QUADRASONICS

WEDNESDAY, MAY 3, 2:00 P.M.
GOLDEN STATE ROOM

F-1 IMPLEMENTATION OF THE STEREO-QUADRAPHONIC (SQ) RECORD SYSTEM
F-2 PLAYBACK EFFECTS FROM MATRIXED RECORDINGS
F-3 IS FOUR CHANNEL A FRAUD?
F-4 SCIENTIFIC COMPARATIVE STUDY OF DIFFERENT QUADRASONIC MATRICES
F-5 A QUADRAPHONIC OSCILLOSCOPE DISPLAY TECHNIQUE
F-6 THE SANSUI QS 4-CHANNEL SYSTEM AND A NEWLY DEVELOPED TECHNIQUE TO IMPROVE ITS SEPARATION CHARACTERISTICS
F-7 ROUNDING OUT THE STEREO DISPLAY

SESSION G
AUDIO IN AM/FM/TV BROADCASTING

THURSDAY, MAY 4, 9:30 A.M.
GOLDEN STATE ROOM

G-1 THE PUBLIC BROADCASTING SERVICE NATIONAL AUDIO DISTRIBUTION FACILITIES
G-2 A STANDARD BROADCAST CONSOLE UTILIZING PROFESSIONAL RECORDING ELECTRONICS
G-3 SPECIALIZED MODES OF RECORDING USED BY THE BOSTON SYMPHONY ORCHESTRA
G-4 THE DORREN QUADRAPLEX SYSTEM OF FOUR CHANNEL FM BROADCASTING
G-5 DESIGN OF A STATE OF THE ART CONSOLE FOR STEREO AND FOUR CHANNEL BROADCASTING
G-6 QUADRAPHONIC BROADCASTING USING THE S Q SYSTEM

SESSION H
ACOUSTICAL NOISE CONTROL

THURSDAY, MAY 4, 9:30 A.M.
LOS ANGELES ROOM

H-1 THE ADVANTAGE AND DISADVANTAGE OF HEARING AIDS IN INDUSTRY
H-2 NOISE POLLUTION AND THE COLORADO LEGISLATURE
H-3 NOISE ORDINANCES AND REGULATIONS IN THE STATE OF CALIFORNIA
H-4 ACOUSTICAL REQUIREMENTS OF MUSIC REHEARSAL SPACES
H-5 DETERMINE BY LITERATURE SEARCH THE METHODOLOGY TO CONDUCT A COMMUNITY NOISE SURVEY

SESSION J
DIGITAL TECHNIQUES IN AUDIO

THURSDAY, MAY 4, 2:00 P.M.
GOLDEN STATE ROOM

J-1 ECONOMICAL SPECIAL-PURPOSE COMPUTERS FOR PROCESSING AUDIO SIGNALS
J-2 PSEUDO-NOISE HARMONIC SOURCES
J-3 HIGH QUALITY PROFESSIONAL RECORDING USING NEW DIGITAL TECHNIQUES
J-4 TIME COMPRESSION AND EXPANSION OF SPEECH
J-5 COMPUTER SIMULATION FOR TESTING SPEECH PROCESSING DEVICES
J-6 ATTEMPTS AT ELIMINATING BACKGROUND NOISE AND ORCHESTRAL ACCOMPANIMENT FROM ACOUSTIC RECORDINGS OF ENRICO CARUSO VIA DIGITAL PROCESSING

SESSION K
ELECTRONICS CIRCUITRY AND SIGNAL PROCESSING DEVICES

FRIDAY, MAY 5, 9:30 A.M.
GOLDEN STATE ROOM

K-1 A RE-EXAMINATION OF S/N QUESTION FOR SYSTEMS WITH TIME VARYING GAIN OR FREQUENCE RESPONSE
K-2 PARAMETRIC EQUALIZATION
K-3 A PRACTICAL ACOUSTICAL DELAY LINE SYSTEM FOR PROFESSIONAL RECORDING APPLICATIONS
K-4 DESIGN CONSIDERATIONS AND DEVELOPMENT OF A MINIATURE TRANSPORTABLE REVERBERATION PLATE
K-5 HUMAN ENGINEERING CONSIDERATION IN THE DESIGN OF FLEXIBLE CUSTOM BUILT SOUND CONTROL CONSOLES
K-6 AN IMPROVED SYSTEM FOR THEATRICAL REPRODUCTION OF 35mm OPTICAL SOUND TRACKS
K-7 HIGH-INTENSITY, MODULAR TRI- & QUAD-AMPLIFICATION/ LOUDSPEAKER SYSTEMS
K-8 DESIGN AND APPLICATION OF AN AUDIO NOISE REDUCTION SYSTEM

SESSION L
TRANSDUCERS

FRIDAY, MAY 5, 1:30 P.M.
LOS ANGELES ROOM

L-1 TIME AVERAGE HOLOGRAPHY
L-2 NOTES ON CONTINUOUS IMPROVEMENT IN HORN DRIVER UNITS
L-3 FOIL-ELECTRET TRANSDUCERS OF VARIOUS DESIGNS
L-4 CORRECTION OF SOME CROSSOVER CONFUSION
L-5 TIME DELAY DISTORTION IN LOUDSPEAKERS
L-6 MODULATION DISTORTION IN LOUDSPEAKERS: PART III
L-7 MICROPHONE TRANSIENT RESPONSE MEASUREMENT
L-8 THE THEORY OF LOUDSPEAKER CABINET RESONANCES

SESSION M
RECORDING WORKSHOP

FRIDAY, MAY 5, 7:30 P.M.
GOLDEN STATE ROOM

MIX MASTERS

The virtues of Yamaha Grands can be heard on hundreds of thousands of feet of tape. Clarity. Power. Rich, full tone. Textural versatility. Dynamic versatility. Yamaha Grands (like this C-7) will help you get it all down, exactly the way you and your talent want it.

Yamaha Verticals are the closest you can come to grand pianos without grand pianos. The U1-D, for instance, has impeccable tone quality and response quick enough to please the most finicky talent. And Yamaha Verticals are made to endure, session after session, year after year.

The Yamaha Electone E-3 is more than a complete professional organ. It's literally a control center for hundreds of colors, rhythms, sound effects, and textures—some unavailable in organs costing twice as much. It can help keep unexpected problems or surprises in a session from turning into glaring holes.

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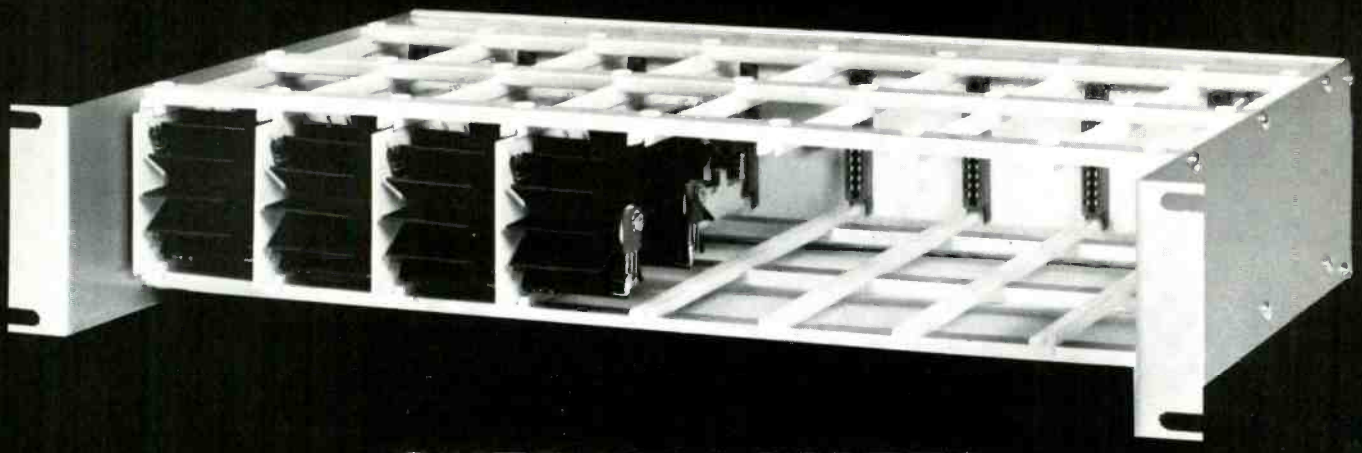


OVER 1000 WATTS

Pictured above is the new SPECTRA SONICS Model 202PC Card Holder. Wired as a four way system, the available power to the loud speakers will be greater than 1000 watts. With this flexible installation system, design is limited only to your imagination.

SPECTRA SONICS now provides the world's first and only multi-purpose power system. This outstanding unit is capable of bi-amplified 2 way speaker systems, tri-amplified 3 way speaker systems, hi-intensity 4 way speaker systems, or any number of multiple speaker systems.

SPECTRA SONICS utilizes the Model 505 Electronic Filter before amplification. Additionally the Model 700 Power Amplifier is used in a bridge (push-pull) configuration. This amplifier system increases the available average power output approximately 3 times that of conventional methods used in the past. Some of the numerous improvements of this new system are listed:

- Lower Amplifier Distortion
- Less Physical Space Required (3-1/2" x 19")
- Reduced Amplifier Cost Per Watt
- Greater Signal-To-Noise Ratio
- Increased Power to Voice Coil
- Easier System Installation
- Greater Expansion Capability

The SPECTRA SONICS Model 700 Power Amplifier is . . . Beyond the State of the Art

Continuous Power Output	60 watts RMS delivered to a load.
Bridged Configuration	(120 watts RMS with 2 amplifiers.)
Power Response	Within ± .1dB, DC to 20 kHz into 8 ohms at full output.
Total Harmonic Distortion	Unmeasurable – less than 1/100th of 1% DC to 20 kHz at full output.
Signal-To-Noise	Better than 100dB below 30 watts unweighted, 20 Hz to 20 kHz, typically better than 120dB.

To obtain additional information contact SPECTRA SONICS at:

770 Wall Avenue
Ogden, Utah 84404

6430 Sunset Blvd., Suite 1117
Hollywood, California 90028

SPECTRA SONICS

LEADER IN ADVANCED TECHNOLOGY

QUAD AUDIO

for the ROCK OPERA 'TOMMY' by Richard Guy entertainers sound services, Inc. Hollywood, CA.

Quadraphonic sound rarely exists yet outside of recording studio control rooms, and the homes of a few adventurous audiophiles. The producers of "The Who's" rock-opera "TOMMY" decided to use a quad sound system for their production in the Aquarius Theatre in Hollywood (former home of "HAIR"). Therefore, small scale experimental techniques had to be translated into large system realities with only two weeks leadtime and a wealth of confidence.

Initial meetings with the show's producer, Brian Avnet, and its production manager/director, David Banks, produced the following general requirements: The sound system must be quad – obviously because it's the latest commercial fad, but also because it would "create a sonic experience as well as a visual one, thus heightening the total tri media theatrical experience." Further, a multi-channel system would aid in clarity of chorus parts and the highly complex musical writing of "The Who's" acoustic and electric guitar parts; and most importantly, quad sound could engulf the audience in the 'trips' (dream sequences) experienced by Tommy by creating motion and spatial placement effects with multiple voices and a large MOOG.

While this system had to be complex enough to handle the soloists, a large rock band on- and off-stage choruses plus a vocal booth (stereo), it had to be simple enough to permit one man operation. "And, of course, it has to be the best and most reliable system used to date in the theatre." These requirements were easy compared to the final system needs: no interference with stage action, and that it not be too expensive!

Since these requirements could hardly be met with the theatres' classic "rack of mixers," the only clear solution was to create an entirely new mixing system designed specially for this show. Inasmuch as most of the speaker system modules and power amplifiers, etc., already existed in the VELVET THUNDER rental systems inventory, the principal effort could be concentrated on the total system design, and on the main audio control mixing console.

Custom Quad Mixing Console

The final requirements for the mixing console worked out to include 36 mixed inputs, each selectable to any or all 4 channels. Quad panning, of course! In addition, separate echo and cue mixing were required on each input. The system needed 5 main vocal input positions, 6 on-stage chorus microphones, 2 off-stage microphones, plus 2 more vocal microphones in a stereo vocal booth. Twenty more inputs were required to handle the augmented rock band.

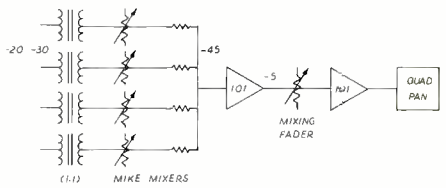
Since this job had been accepted with a limited budget and limited time, the decision was made that VELVET THUNDER would build the console with the design assistance of the author (formerly of SPECTRA SONICS, Hollywood), while the Aquarius Theatre carpentry department would provide a mixing desk. From design conception to completed installation, the mixing console took a sleepless 10 days!

From the console design standpoint, perhaps the most difficult problem was deciding how to construct a mixing system with 36 inputs that a single engineer could physically handle. The size dictates of such a system were monstrous: 36 inputs with standard console spacing (1½ inches) would require a mixing control length over 54 inches, and that without the monitor and output sections. Obviously, such an approach wouldn't hack the problem. Analysis of the band instrumentation and its orchestration suggested that a practical solution lay in the area of choir-mixing.

This choir mixing was accomplished in the following manner: On 6 mixing positions, the faders control the combined output of 4 separate mixed inputs. In this manner, similar instruments share a single mixing attenuator which functions as a group master. Further, it was readily apparent that functions common to each microphone (echo, EQ, cue, quad position) could be shared without major compromise. Thus a total of 24 input sources were placed in 6 choirs of 4 mikes each. This approach reduced the number of mixing faders from 36 to 17; a staggering saving in space, and easily within the reach and control of a single operator.

Previous experience designing rock system equipment indicated special care would be required in the design of the choir-inputs to keep *average* levels reasonably near normal level parameters. When microphones are used on electric instrument amplifiers or inputs are connected to bridging boxes, levels in the -30 to -20 dBm range are not at all uncommon. Generally, the normal approach is to pad inputs 20 to 30 dB. This high input level suggested an innovative variation in microphone input circuitry. (See Figure 2).

FIGURE 2 INSTRUMENT INPUT CHOIRS

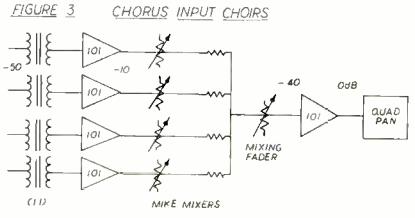


This circuit utilizes a conventional input transformer (1:1) load loaded with an Allen-Bradley G-series potentiometer. The impedance value of the potentiometer was selected to provide optimum secondary damping on the input transformer, while the wiper resistor was selected to approximate a modified log, or audio taper. Worst-case loading of any mixing pot presents a microphone load impedance slightly higher than that of the normal microphone preamplifier, so microphone performance is not degraded. The actual input impedance seen by the microphone preamplifier is low enough to be at an excellent point on the input noise curve of the amplifier, while the losses thru the mixing network establish a normal, if somewhat hot, input level. Potentiometer wiper noise after some 75 performances is simply not apparent or audible.

It should be noted that the true equivalent input noise and input noise vs. resistance curve of any preamplifier selected for this type of circuit is critical. Input amplifiers whose design requires step-up transformers would require different circuitry/component values and could not offer the performance or latitude valuable to this input circuitry.

For the two input-choirs handling vocal information from the on- and off-stage choruses, the added gain of a microphone preamplifier per input was required because of the much greater working distances from the microphones. The details of this circuit are shown in Figure 3.

FIGURE 3 CHORUS INPUT CHOIRS



The mixing console was provided with a "post" echo send control and the output of the echo send system was fed to an ORBAN Parasound reverberation system. This unit was selected for its unique lack of "sproing effect" as well as its obvious advantages of size and price. The cue system provided utilizes individual position mixing, taken off prior to the main mixing faders. Initially, one such circuit was provided.

That's where the fun began: providing cue for a rock band and vocalists scattered all over a huge (45' x 65') stage, with the rock band wailing away on one side turned out to be quite an exercise. Naturally, whatever worked for the band didn't for the soloists, etc., etc. The conductor required separate information, as did the booth vocals. Predictably, the band couldn't agree on the cue mix, and of course, the whole thing fed back a lot! So when the dust settled and the screaming stopped, this is how the final cue score looked:

SIX separate cue circuits were provided! Contrary to popular opinion, not everyone had his own mix. There were, however, a number of innovations which might have significant applications elsewhere. Vocal foldback or stage cue is provided by an overhead compression driver/horn assembly located high over the audience on a lighting trapeze. This horn supplies vocal program only above 800 Hz. This not only works, but very satisfactorily. Incidentally, feeding complete (800 Hz up) show program thru the horn didn't make it: the snare drum was reproduced so well that it bounced off the elaborate milti-layer stage set like reflected laser beams.

One might presume that vocalists twenty feet from a rock band could hear the music, but this is not always the case. So additional monitor speakers were added at the foot of the stage apron. High-efficiency ALTEC Model 755E 8-inch loudspeakers were utilized and carry **only** band program. Such a divided cue system approach permits incredible on-stage cue levels without system feedback.

The mixing console system is equipped with integral peak limiting/volume compression amplifiers (Spectra Sonics model 601) built into the output channels. Under normal operation, these units are used only for inaudible peak limiting. In several vocal numbers, they also perform the function of third-hand volume compression. This particular design utilizes a 100:1 peak limiting curve providing **maximum amplitude protection inaudibly**. These units are utilized between the channel sub-master controls, and the ganged master gain control. The gain has been restricted in the output stages (after limiting) so that NO **average** level program can be clipped in the output or following power stages.

Loudspeaker Systems

Selection and placement of the various loudspeaker systems used for this production entailed a good deal of early planning. As a result, initial results were so satisfactory that very little rearrangement was necessary. The basic consideration was that everyone in the theatre should hear excellent sound, and that a maximum number in the audience should be able to experience the multi-channel effects. Further, special attention was given to those front few rows where theatre patrons historically have seen great stage action, at the price of poor sound.

Since achieving healthy levels in the auditorium with excellent quality sound was not a major problem, considerable effort could then be expanded in the area of the quad layout. For this production, two main systems were installed very wide in the lighting boxes in the sides of the auditorium. These three-way systems utilize 90° horizontal dispersion radial horns. By aiming them appropriately, each system could be made to cover almost the entire hall. The high-frequency horns were placed for coverage up to the edge of the stage apron. Some peripheral areas were a little weak as this particular theatre is more nearly round than rectangular, and the stage apron, originally designed for dancing girls, protrudes into the auditorium.

The next problem was good coverage for the seats down front. The decision to use very wide spread left-right front speakers provides for excellent stereo effects for the bulk of the audience, but creates disaster in the front rows. This problem was solved by using two special-design wide-angle radiating slots composed of six exponential horn segments each. These 'horns.' (JBL model 2397), designed some years ago and not in very common use until recently, are usually referred to as "Smith horns." With two of these units being fed the same program audio as the front/side systems, in stereo, front row coverage was excellent and the feeling of source identification/direction, so necessary in this sort of production, was clearly established. This technique represents a substantial improvement over the usual method of hanging horn clusters overhead, as the apparent source of the sound comes from the performers on stage, not from the heavens above.

Probably the most unusual aspect of this sort of horn system usage is that it is NOT full range. These systems are fed program audio from 500 Hertz and up. The immediate reaction to this statement is that "it will produce an unsatisfactory balance." This is not entirely so. When you listen to the show, sitting directly in front of one of these systems, there is so much low frequency energy coming off the stage, and from the side systems, that when the bass attack transients and upper harmonics come from these horns, you actually get the sensation that the horn is producing wide range audio program. The particular design of this horn is such that the sound radiation is spread over an approximately 20° x 120° field, so field density is moderate, while obtaining exceedingly wide coverage evenly.

The rear speaker systems present only minor problems. They had to be hung from the auditorium ceiling supports so that very large speakers were not possible. Since it was planned to use these systems for simply sweetening the front sound, and the quad/surround effects, a rather unusual speaker was selected as suitable for this purpose, the JBL Model 2150 composite transducer. This contraption looks like some sort of speaker turned inside out: it is composed of a high-efficiency, 15-inch low frequency transducer similar to the JBL D-130, and a five-inch coaxially mounted cone speaker similar to the JBL LE-5. These units were mounted in ALTEC Model 612 cabinets which happened to be available, and whose volume/porting are very near that required for the JBL devices.

Two each of these systems were mounted in the rear corners to provide side and rear quad coverage. Balancing the rear speakers to the front systems did not prove to be difficult. The angular dispersion provided by the two systems in each corner provided smooth coverage. The only hitch came in the top end. In order to achieve a reasonably linear high–frequency sound entirely throughout the hall, it was necessary to help the five-inch cone transducers a little on the top end. Approximately 3 dB of boost (gaussian curve) was added in the 10-12 kHz range to brighten up the top end from the rear speakers, by equalizing the rear channel output amplifiers of the mixing console.

The front speaker systems used for this production are composed of three modular sections. Two separate bass cabinets are used, each utilizing two high-efficiency JBL low-frequency transducers in critically-tuned, port-loaded enclosures. The mid and high frequencies are produced by a pair of compression drivers/radial horns mounted in a third enclosure. The low-frequency systems are stacked together to enhance the low-frequency coupling effects, while the horns are carefully positioned in horizontal and vertical axises for maximum coverage.

Power Amplifiers

The power amplifiers utilized for this system installation are electrically and mechanically modular (Spectra Sonics model 700). In view of the many changes and additions in the cue system(s), the modular feature has proved to be an unexpected blessing.

total tape duplicating with "BUILDING BLOCK" simplicity

CASSETTE TO CASSETTE, REEL TO CASSETTE, REEL TO REEL

The Telex series 235-1 is more than just another tape duplicating system. It is a concept based on modular "building blocks" which complement each other and provide total flexibility for tape duplicating. It solves the problems of interfacing between open reels and cassettes. It is a system designed for future expansion. Engineered to make tapes of true, professional quality. And it's priced within your budget.

The Telex system consists of only five basic units.

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2. Cassette master play transport.
3. Open-reel master play transport.
4. Cassette slave record transport. Records three cassettes simultaneously.
5. Open-reel slave record transport.

The five units are totally compatible. Intermix cassette and open-reel master or slave transports to suit your duplicating requirements; cassette to cassette, reel to cassette, reel to reel, or even cassette to reel. All units fit into table top consoles of uniform size so when your requirements change, you just add more units. It's that simple. Telex series 235-1 is heavy duty equipment with hysteresis synchronous motor tape drives, momentary push button controls and time delay circuits for smooth, positive tape handling. Selected premium grade duplicator heads provide long life and excellent frequency response. And fail safe, automatic features enable non-technical personnel to operate the system efficiently. Telex "building blocks" make a totally flexible and complete duplicating system. It's the sensible approach, designed to meet your needs today, next month and in the years to come. Made in the U.S. to professional standards.

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Cassette Slave. 3.75 - 7.5 or 7.5 - 15 IPS. Half track 1 or 2 channel. Quarter track 2 or 4 channel.

Open Reel Master, 7.5 - 15 IPS. Full track. Half track 1 or 2 channel. Quarter track 2 or 4 channel.

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EXPORT: ROYAL SOUND COMPANY, INC., 409 North Main Street, Freeport, N.Y. 11520

Circle No. 121

The main speaker systems are tri-amped and utilize active electronic crossover filters (Spectra Sonics model 505). Use of these filters has permitted higher, safe operating levels on transducers while substantially reducing the dynamic distortion and saturation effects characteristic of traditional passive crossovers. The composite transducers are operated bi-amped.

Every single speaker in the entire installation is driven by its own amplifier, or bridged pair of amplifiers. This not only results in a startling improvement in audible program quality, but permits a very high level of transducer protection. Each driving amplifier(s) is fused with values suitable to protect the transducer. Further, should any amplifier or single transducer fail, only a small portion of the total system would be affected. The improvement in system reliability from such an approach is self-evident, especially when compared with present sound industry trends toward hanging many transducers on very large power amplifiers.

The power amplifiers used in this installation are driven by a 50 ampere, regulated DC power supply. This power supply, driven directly from 220 VAC power lines, holds the DC supply voltages to within 2% from a no-load to full-load condition, and over an AC line variation of ± 20 volts. The regulated power supply makes a noticable improvement with high-level, low-frequency program such as the MOOG.

The total power available for this system installation exceeds 4000 watts RMS. Since the power amplification is supplied in bi- and tri-amp configurations, the total power available is not simply added arithmetically; but, whether or not you simply count the amplifiers and add total wattage, or you calculate the power as discussed in "Bi and Tri Amplification" published in the March/April 1971 issue of RE/P, a number of observations are worthy of mention.

Bi-amp and Tri-amp systems represent an extremely efficient means to use audio power. This efficiency becomes a vital consideration when you are dealing with power systems measured in kilowatts, and the dollars necessary to produce such outputs.

System signal to noise: While industry practice in the theatre does not always indicate it, signal to noise is probably the most important characteristic of a good theatre system. That statement would certainly find no quarrel if expressed in terms of dynamic range: with 'headroom' the general reaction is that "you can't have enough." There are times when looking at the other end of the dynamic range spectrum is at least as important, particularly with respect to power amplifiers.

The system developed for "TOMMY" will easily produce average broadband levels of 110 dB SPL in the center of the auditorium. Under normal show conditions, however, the loudest portions (usually the final numbers), rarely get within 10 dB of the maximum output capability of the system; while most numbers run with average levels, as defined by the VU meters, 20 dB below system maximum output capability! The quiet numbers of the show are operated with levels so low that the VU meters barely move. These musical numbers are especially interesting in view of the complete absence of any audible hiss or hum in the system with all controls at normal operating levels. This deserves at least an honorable mention. Remembering "HAIR" in the same theatre, there was never a question as to whether the power amplifiers were turned on!

Finally, when dealing with amplifier power in kilowatts, and loudspeakers with capabilities measured in tons of watts, one must mention reliability. System reliability — vital to a live performance situation — comes from only two places: excellence in product design with the elimination of the causal factors of failure, and a thorough understanding of the principles of system design requirements. In nine months of operation of this and similar systems with output capabilities between 4 and 8 kilowatts, VELVET THUNDER has not lost one single amplifier or transducer in any kind of operational failure: An enviable and profitable record, to say the least.

Microphones and Musicians

Selection of microphones for this production entailed far more than anyone imagined initially, and next to expenses, fell into the area of one of the most difficult problems: "the sound system must not interfere with the stage action."

When Joel Rosenzweig originally conceived the Tri-Media presentation, the band was to be visible on stage and would contribute along with the elaborate visual effects and performers to a Tri-Media presentation. As the show progressed through early rehearsals and construction, the band was pushed off to the side of the stage.

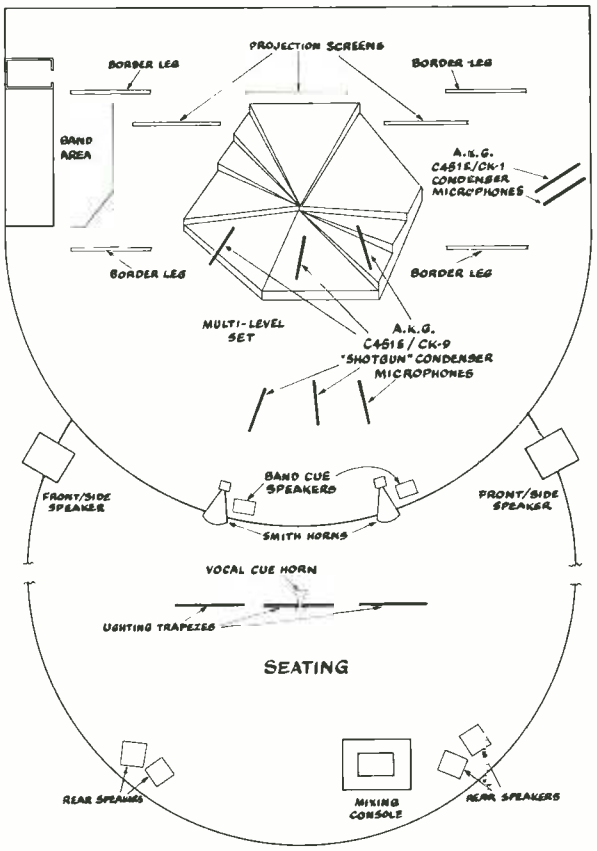
The producers were determined to avoid the multitude of sound problems that have plagued other rock musical presentations. As a direct result, elaborate, extensive and expensive measures were taken to house the band in a specially constructed enclosure to create a greater degree of control. A vocal booth was provided for the narration vocals, harmony and duet voices which play a prominent part in the presentation.

The enclosed band area was built on two levels, with percussion, brass and vocal booth approximately two feet off the floor. The balance of the band was placed

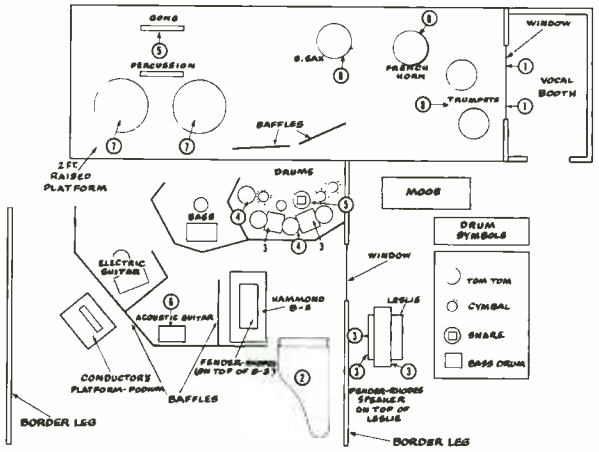
on the stage floor over layers of rug padding and rugs. Acoustically deadened canopies were placed over the entire percussion/brass area and over the elaborate drum set. The walls of the band enclosure were highly damped to prevent low frequency resonances, and the surfaces faced with architectural compressed fibreglas materials for broadband frequency absorbtion.

While this deadening of the band area significantly reduced leakage and increased mixing control, two serious problems remained. One, the on-stage chorus pickup, and secondly, the musicians ability to hear and play together.

"TOMMY" HOUSE LAYOUT



BAND AREA



Initial plans for on-stage chorus pickup were to use an overhead MS stereo microphone or two. Tests in rehearsal proved this to be an acceptable technique, insofar as vocal pickup and quality of chorus sound were concerned, but serious and irreconcilable difficulties prevented its use. Off-mike lead vocals couldn't be made to sound like on-mike lead vocals, but worse, a rock band 30 feet from the microphone is substantially louder than a vocalist 6 feet from the same microphone. While the extensive acoustic treatment in the band area helped, alternatives had to be found. Foot mikes were ruled out because of the proximity of the band, and because the multi-tiered set placed vocals too high and too far away.

The solution to this problem came with the use of 'shotgun-type' condenser microphones stragetically placed over the stage and aimed for solo and chorus pickup. The AKG CK-9 interference tube with its club-shaped pickup pattern on axis and very dead sides gave us better than four times the working distance of any other microphone while still producing a rich, full-bodied vocal sound. The ease of phantom powering from the mixing console power supply further facilitated the use of these condenser systems. While the 'shotgun' microphone is not a cure-all, it delivered really workable results when no other technique or tool could.

Off-stage chorus pick-up and the stereo vocal booth were much easier. A pair of AKG C-451-E/CK-1 cardiod condenser microphones were provided for a 'large-choir sound' off stage. The stereo vocal booth is used by two, three or four vocalists at once. Since these vocalists tend to sing very close to the microphones, two-way dynamics were selected for their lack of proximity effect (AKG D-200-E). Vocal clarity and intelligibility, a must for the audience to understand and follow the story line, was greatly enhanced by this control of proximity effect.

Soloists use three different microphones, in several different ways. Most vocals use AKG D-1000-E dynamics because, simply, they sound better; and because the "S" position equalization shelves the bass response in such a fashion as to control proximity effects and popping and provides a uniformity of sound as the microphone is shifted in relative position during stage action. For a number of the problem vocals, a new dynamic was used, the AKG D-124E. This microphone has a very smooth response characteristic, a tight cardiod pattern with frequency, and a top-end sizzle that sounds like a condenser.

The difficult stage action vs sound problems were solved in two separate ways: the use of concealed wireless microphones, and the use and positioning of the overhead hanging 'shotgun' condenser microphones to pickup selected solo voices. Several wireless microphone systems were tried during rehearsals, and only one system provided the sound quality of a wired microphone: the VEGA 55/56 system. Two of these miniature units are traded between several soloists throughout the show with hand-held D-124E dynamics and concealed D-109 lavalier mikes. A number of the new miniature electret condenser lavaliers were tried, and while high end response was more extended than the dynamics, the evident flatness of response, as judged by actual program output before feedback was substantially inferior.

The balance of the microphones used within the band are reasonably conventional. Piano pick-up is by means of an AKG C-451-E/CK-2 omni condenser microphone inside the lid, which is heavily draped for isolation. Acoustic guitar is picked up by a Sennheiser MKH-405, used for its hard, bright top end. Drums were miked with two overhead AKG C-451-E/CK-1 cardioid condensers (in stereo), with a D-1000E used for snare drum pickup. Two additional D-190E dynamics were used inside the stereo (!) bass drums. Stereo percussion pickup (tympani and other special effects) was achieved by use of two D-124E mikes, selected for tightness of pattern, sound quality, and top-end sizzle. Brass instruments were miked with RCA ribbons for a somewhat softer sound.

The electric bass, electric guitar, and the MOOG are all picked up by means of bridging transformers. The electric bass is bridged directly off the instrument, while the electric guitar is bridged off the amplifier speaker. This latter connection permits pickup of all the guitarist's special effects, fuzz, distortion, and most unfortunately, the poor SNR of the amp. The MOOG is simply fed through a repeat coil for ground isolation. The low-frequency capability of this instrument is awesome, and the effects generated by its friend and keeper, Phil Davis, add to the excitement of the production, its spectacular quad sound effects, and the "oohs and ahs" of the startled audiences. This is the first major stage production to make use of a MOOG 'live-in performance.'

Amplifiers are used for the electric guitar, electric bass and MOOG so the performers can hear what they are playing. This solved the hearing/cue problem, but it seems that the gain stability of musical instruments amplifiers isn't very good: the gain of these amplifiers seems to creep up by itself during performances, leading to occasional variables in the band mix. The acoustic guitar player probably has the roughest time of any of the musicians. Being able to hear his instrument above the din of others augmented by considerable electronics is really an impossible problem. Use of a cue mike and a small amplifier was tried, but the feedback was a nightmare. This was solved by the addition of a direct pickup on the guitar which then feeds a small amplifier located at his feet.

Finally, a few words are in order about the man behind the controls. It seems very often in the sound indsutry that you hear the opinion voiced that the real pro mixers work in the major recording studios. A comparison of the controlled environment in the recording studio and its ability to retake and re-mix with the devastating consequences of mixing 36 inputs live, in real time for an audience, makes you wonder where the real experts really are.

A typical change between songs in this production, often simply segued, normally requires an average re-setting or adjustment of 20 to 25 controls; including not only mixing levels, but cue, echo, EQ and quad position. The man behind these controls, Bill Hennigh, was performed remarkably while under considerable pressure, and from a mixing location far from ideal. I suppose that it's some sort of commentary on the system that when the audience files past the mixing console after the show, they very often ask, "This was on tape, wasn't it?" *END*

DICTAPHONE CONSOLIDATES SCULLY AND METROTECH IN NEW MOUNTAIN VIEW, CALIFORNIA PLANT.

Scully Recording Instruments Company, a wholly-owned division of Dictaphone corporation since May 1967, recently announced the third and final phase of its consolidation program with another Dictaphone division, Metrotech, by announcing its expansion and relocation from Bridgeport, Connecticut to a new 41,000 square foot facility in Mountain View, California.

The consolidation program began in January 1971 with the establishment of a common Scully and Metrotech sales and service organization. The Recording Automation Group (RAG) sales organization in 1971 established regional sales and service offices in the major recording centers of Los Angeles, Chicago, Nashville and New York and plans future offices in Washington, D.C., Dallas and Toronto.

Engineering Departments of the two organizations, Scully and Metrotech, were reorganized in late 1971 under Mr. Earl Peterman, Vice President, General Manager – Metrotech, with a West Coast location selected for the consolidated Engineering Group. The California area was selected due to the abundant labor pool of professional recorder R & D, engineering, manufacturing and quality control personnel available and general high technology of the area. This new enlarged Engineering Group, with substantially greater budgets to those of the combined Scully and Metrotech budgets over the past few years, has already done extensive work on a new series of professional audio recorders, loggers and other proprietary programs and continues to grow in size of personnel and space.

According to Edward C. Ittner, V.P. Marketing of the Recording Automation Group, Scully's bulging sales, the greatest in the Company's twenty-year history, created a real need for an enlarged and more modern facility. After evaluating all possibilities, it was decided for efficiency, economy, labor pool and a desire to keep a high technological manufacturing facility near its Engineering Department to move both Scully and Metrotech into a new 41,000 square foot building at 475 Ellis Street, Mountain View, California 94040.

The new headquarters for both the Scully and Metrotech Divisions, hereafter referred to as Scully/Metrotech, will house the Engineering, Manufacturing and Sales organizations.

The physical move to the new location will occur in stages over the next five months, with Metrotech moving into the facility by April 1, and Scully by July 1. For a period of three months, Scully product will be manufactured at both Bridgeport and Mountain View to assure continuance of finished product and spare parts delivery. In addition, Scully is currently building a large inventory of finished recorders, major and minor subassemblies and detailed parts.

In closing the plant at Bridgeport, many of the 100 employees will be relocated into other Dictaphone manufacturing facilities in Bridgeport,Connecticut.

A regional sales and service center, to ensure continuance of delivery and service to Scully's many good East Coast customers, will be in operation within 60 days in Manhattan.

Have you ever noticed this trademark on your best sounding records? It is stamped in the lead-out groove of records mastered at:

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6430 Sunset Blvd., Suite 1516
Hollywood, California 90028
Phone: (213) 461-2751

New Tools for Professional Monitoring

THE 8050A REAL TIME ANALYZER provides continuous audio spectrum scanning every 30 ms, 40 Hz to 16 kHz on ISO center frequencies. Has *fast* RMS response for visual program monitoring and *slow* RMS response for room equalization. Cost is about 1/3 of competitive models

THE 9860A ACTIVE EQUALIZER has phase and amplitude transfer characteristics identical with those of the Altec passive equalizer. Permits detailed equalization from 40 Hz to 12.5 kHz. High and low-pass functions, 18 dB/octave, permit more precise finishing of frequency extremes. Cost is about 1/2 of comparable passive devices.

THE 8080A PINK NOISE GENERATOR plugs into standard Altec mixers. An ideal flat and stable noise source for room/speaker equalization with 24V power supply or battery. Cost is about 1/5 of standard noise generators.

THE 771B BIAMPLIFIER has a switchable 12 dB/octave crossover at 500, 800, and 1500 Hz. Can be adapted to most studio monitoring systems and coaxial speakers. Acoustical balances can be exactly controlled by separate HF and LF gain controls. The LF section delivers 60 Watts and the HF section 30 Watts continuous sine wave power.

For more detailed data and specs write Altec, Professional Studio Products, 1515 S. Manchester Ave., Anaheim, Calif. 92803.

ALTEC

Circle No. 126

NEW PRODUCT NEWS

3M INTRODUCES 24 TRACK, 16 TRACK, 8 TRACK PROFESSIONAL RECORDERS AND OPTIONAL SYNCHRONIZER.

The new Series 79 3M Professional Audio Recorder/Reproducer will be available in 8, 16, and 24 track configurations. The 8 and 16 track machines can be converted to the higher configurations. Conversion can be accomplished readily with expansion kits which will be available to convert 8 track machines to 16 or 24, and 16 tracks to 24.

The DC servo capstan system, which is incorporated in the 3M brand professional recorder Isoloop differential drive system, enables operation of the unit with variable speeds ranging from 5 to 45 ips, in addition to fixed speeds of 7½, 15 and 30 ips.

An additional feature of the new recorder is the provision of space in the cabinet for addition of state-of-the-art noise reduction circuitry. Complete record electronics for each track has been reduced from four printed circuit cards to one. Remote transport and electronic controls also are incorporated in the recorder cabinet, but may be removed for use at the control console. A convertible 110-220 volt power supply is provided to make the recorder/reproducer easily adaptable for overseas applications.

The 3M Brand Series 79 *Synchronizer* will be available as an accessory to provide versatility of the audio portion of video tape productions. The unit is capable of synchronizing the recorder to quadruplex or helical video tape recorders, film chains or other audio recorders. The SMPTE time code is utilized by the synchronizer to phase-lock the video and audio recorders together.

Prices have not yet been firmly established, but are expected to be approximately $29,000 for the 24 track recorder, $20,000 for 16 tracks, $15,000 for the 8 track and $8,500 for the synchronizer. Prices for the conversion kits are expected to be approximately $7,500 for the 8-16 kit (for conversion from 8 to 16 tracks), $13,500 for the 16-24 kit and $17,500 for the 8-24 kit.

MINCOM DIV. 3M CO., 300 SO. LEWIS RD., CAMARILLO, CA. 93010.

Circle No. 127

SPECTRA SONICS ANNOUNCES A NEW FLEXIBLE INSTALLATION SYSTEM FOR HI-POWER, HI-INTENSITY SOUND SYSTEMS. The new model 202PC Card Holder is designed to house the Spectra Sonics model 505 electronic filter and model 700 power amplifier. These units are all modular plug in construction. The versatility of this system allows many design configurations. Bi-amplification, tri-amplification, or quad amplification may be utilized with this one convenient package. Upgrading to higher power requirements or changes in system demands presents no problem. Modification in the field may be accomplished with ease.

The model 202PC Card Holder is equipped with nylon card slides, eight bifurcated contact circuit card connectors, and individual balance controls all mounted on the printed circuit card holder. Optional items available for use with the model 202PC Card Holder are; Two Spectra Sonics model T66 input transformers for application in balanced systems, and a front panel of satin finish anodized aluminum with pilot lamp.

The model 202PC Card Holder requires a minimum amount of panel space. The design is such that eight modular model 700 power amplifiers will mount in 3½" of rack space 19" wide. SPECTRA SONICS AT: 770 WALL AVE., OGDEN, UTAH 84404

Circle No. 128

TABER ANNOUNCES ITS NEW TABERASER. "Taberaser" is the name given to the new tape eraser introduced by Taber Manufacturing & Engineering Co. to the television and recording industries.

The new "Taberaser" is precision made to erase audio, video, instrumentation tape, and magnetic films from 150 mil to 2" widths. The new eraser is designed so that tapes on reels or in cartridges can be degaussed without the necessity of unpackaging.

According to Taber, an added feature of this tape eraser is that the field is automatically diminished slowly at the end of each 30-second cycle, thereby eliminating the well-known "Thump." Between 30Hz and 15KHz the depth of erasure is 76db below saturation.

The unit will not overheat and is kept below 71°C by the "Taberaser's" Automatic Heat Limiting circuit, which activates an internal blower until the unit returns to the correct operating temperature.

The 45-lb. eraser costs $395.00 and measures 6¼" high by 14-1/8" wide and 16" deep. Power requirements are 95-135 VAC, 58-62 Hz, 1 phase, 3 wire and uses less than 8 amps under any condition.

TABER MFG. & ENGINEERING CO. SAN LEANDRO, CALIFORNIA 94577.

Circle No. 129

Re/p 42

REVOX LAMB MIXER TYPE PML420.

Designed for location stereophonic recordings in conjunction with Revox A77 or similar type machine; can be used for 2 channel mono recording or reduction and over-dubbing with the use of the limiters.

Inputs: Four channels, each incorporating mic sensitivity, top, mid and bass controls, echo send, pan pot and channel fader inputs on cannon XLR 3 plugs.

Outputs: Two groups, each with echo return, group fader, limiter in/out, adjustable threshold and release. Outputs via standard jack sockets.

Performance: Inputs; Switchable to line or to 50K ohm or 1K ohm unbalanced: 500 microvolt to 2 volts sensitivity. Outputs; 600 ohm unbalanced nominal 1 volt. Noise; Normally 75 dB below line out. Distortion; within 0.1% at normal levels. Limiter ratio; approx. 12 to 1. Limiter rise time; 1 millisecond. Limiter release time; 0.25 to 3 seconds. Equalizer; Top 15 dB lift and cut at 10 kHz, Mid 12 dB lift at 3.5 kHz, Bass 15 dB lift and cut at 60 Hz.

Power Supply: External (not supplied as standard) 24 volt stabilized.

REVOX CORPORATION, 155 MICHAEL DR., SYOSSET, N.Y. 11791.

Circle No. 131

AMPEX ANNOUNCES FILM LOCK ACCESSORY FOR MM-1000 RECORDERS.

The new Ampex film lock system permits film makers to record up to 15 channels of sound, add special effects, dub down to one or two channels, and play back the final sound track in perfect synchronization with the pictures.

In addition, the MM-1000 when equipped with the film lock will start, stop, and reverse in perfect synchronization with sprocketed equipment and will return to sync from a stop.

The system locks an MM-1000 multichannel recorder to an interlocked film chain of projectors and sprocketed recorders. It consists of a tachometer coupled to a projector which produces 100 pulses per film frame. The pulses are compared with a prerecorded control track on the MM-1000 to maintain synchronization.

The film lock system is mounted on an MM-1000 under the electronic channel controls for ease of operation. Controls on the film lock rack permit raising or lowering the original sound track a half tone for special sound effects. In addition, the recording on the MM-1000 may be moved a preset number of frames ahead or behind the film in sync. Additional MM-1000s may be locked into one tachometer.

Price of the film lock accessory for the MM-1000 is $7,500. Units are available for immediate delivery.

AMPEX CORPORATION, 401 BROADWAY, REDWOOD CITY, CA. 94063.

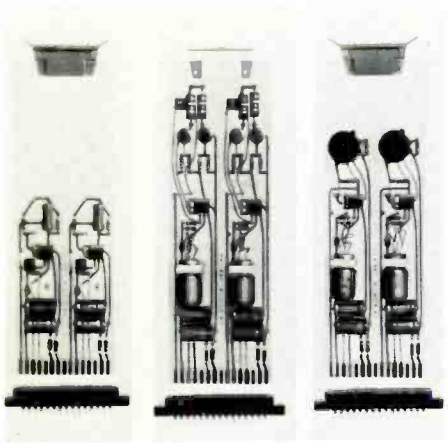
Circle No. 132

FAIRCHILD SOUND LAUNCHES NEW IC OP-AMP SERIES OF PROFESSIONAL AUDIO CARDS. Fairchild Sound has announced a new series of economical integrated-circuit op-amp components for professional audio. Among its highlights is an innovative amp/preamp/limiter, which is unique because it is a part of the input circuit and automatically prevents overload, eliminating the need for pads at the mic preamplifier.

There are now 24 basic processing cards in the new series, designated INTEGRA III, for broadcasting, recording, communications and sound reinforcement applications.

In addition to the new amp/preamp/limiter, Model 725AI, the series includes line distribution and microphone ampli-

fiers, automation oscillator and filter circuits, tape and phono amplifier-equalizers, summing or mixing amplifiers, and remote stereo gain control circuits.



All cards are 2½" high for 3½" files and come with PC connectors. Prices range from $30 for Model 725A, a basic amplifier circuit with continuously adjustable gain from 0 to 35 db, to $115 for Model 725ADL/T2, which consists of two of the amplifier limiters on a single card with input transformers, and for Model 725LAD/T2, consisting of two line amplifiers on a single card with input transformers.

The 725AL is priced at $45. A basic amplifier with limiter circuit added, it permits maximum gain of 35 db before limiting action. The limiter, working in the feedback loop, extends the amplifier's dynamic range another 30 db before overload takes place. Limiting slope is 40/1.

The unit, described as impervious to shock, vibration or burnout, is also available with an input transformer (Model 725ALT, $70). Model 725ADL has two amplifier/limiters on the same card for $65. The addition of an input transformer creates Model 725ADL/T2.

FAIRCHILD SOUND EQUIPMENT CORPORATION, 15-58 127 STREET, COLLEGE POINT, NEW YORK 11356.

Circle No. 133

NEW ALTEC MODEL 655AL OMNI DYNAMIC MICROPHONE. The Model 655AL has a flat response to provide faithful reproduction of drums, acoustic guitars, and other musical instruments requiring exacting sound fidelity. The pick-up pattern is also excellent for group vocal work on stage or in the studio.

The 655AL has a frequency response of 50 – 15,000 Hz and an output impedance of 150/250 ohms. It is also available in a high impedance, Model 655AH.

Pop and wind blast noise have been virtually eliminated by filtering which precludes the need for a wind screen during

outdoor usage. The unitized design of the cartridge and shock mount includes such features as field replaceable cartridge and extremely low case and cable noise during handling. Additionally, the steel case and the non-reflecting matte finish of the 655AL adapts to the rugged demands of the professional artist.

ALTEC, 1515 SOUTH MANCHESTER AVE., ANAHEIM, CALIFORNIA 92803.

Circle No. 134

STEPHENS MODEL 214 VARIABLE SPEED OSCILLATOR.

A solid state power supply to accurately control the speed of the capstan motor of a recorder or similar system by varying its supply frequency. Features six position control switch: (1) "Emergency A.C." – 117 volts fed directly to putput to eliminate down time; (2) "Off"; (3) "Sync" – frequency controlled by external source. Maximum input +8 dbm; (4) "Auto" – frequency controlled by external source. Output switches to sync with power line frequency if external signal drops below 0 dbm; (5) "Line" – unit operates in sync with power line frequency; (6) "Internal Oscillator" – varies frequency between 40 and 80 Hz. Can also be controlled by external D.C. voltage. Fine tuning provides frequency control of ±1 Hz.

Price: $685.00. Available from stock.

STEPHENS ELECTRONICS, INC., 3513 PACIFIC AVE., BURBANK, CALIF. 91505. 213/842-5116.

Circle No. 136

TELEX SLIDE SYNC CASSETTE RECORDER AND PLAYER. Telex has expanded its line of instructional cassette equipment with addition of two slide sync models; a recorder/player and a player only. The units are designed and built to offer the most effective means to combine audio and visual instruction techniques. Both models provide complete control for tape and slide projector, including built-in remote focus and individual slide Advance/Reverse and tape Start/Stop functions.

The outstanding feature of these dual capstan units is the unique review function. The single Review key will automatically back up the presentation to any desire point, keeping the audio tape and slides in synchronization. This allows immediate repetition of any portion of the program without losing synchronization. Both models also have instant pause capability, tone and volume controls, tape fast forward and reverse and end of tape sensing.

The Slide Sync Cassette Recorder provides individual record capability for the audio track and the sync track. This gives the option of recording both audio and sync signal, adding just the sync track to a prerecorded cassette or using the unit as a standard monaural recorder. Tape/slide presentations can be easily created by combining the audio (either prerecorded or do-it-yourself) with the sync signal. The recorder can also be used as a P.A. system for adding narration to supplement the program at anytime without being recorded.

Sync signals which conform with standards proposed to ANSI are fixed at exact frequencies and time duration to control advance and stop functions, but existing tapes with sync signals prepared on other machines can easily be modified for use by re-recording new sync signals in place of the old ones. The Recorder also has a monitor control for monitoring the program while recording and a sync On/Off switch which turns off the sync channel to allow playing of standard cassettes.

Slide Sync Record and Player will be priced at $399.95 and $329.95 respectively.

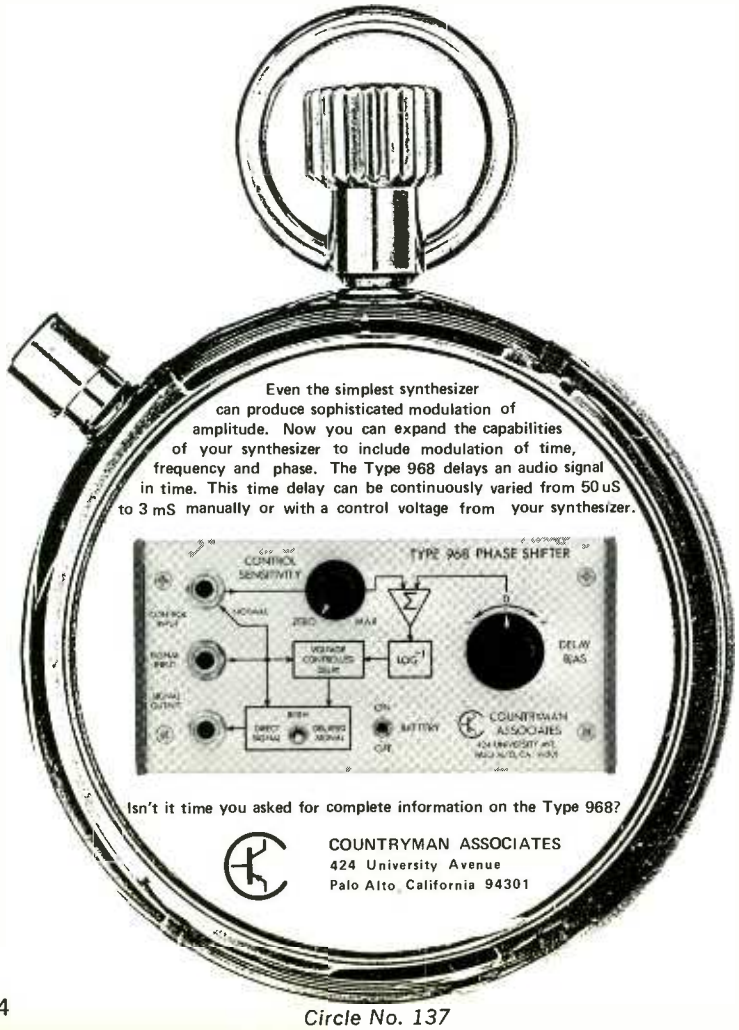
TELEX, 9600 ALDRICH AVENUE SOUTH, MINNEAPOLIS, MN. 55420.

Circle No. 138

SONY/SUPERSCOPE PHANTOM POWER SUPPLY.

The SONY Model AC-148A Phantom Power Supply will supply 49 Volts DC to up to twelve condenser microphones when adapted for central powering use, and will power two condenser microphones in remote recording and/or broadcast situations. The AC-148A is specifically designed

to power SONY Condenser Microphone Models C-500, ECM-22P, and C-37P, but is equally suitable for use with other microphones with phantom power capability. In addition, dynamic and ribbon



Circle No. 137

microphones may be connected to powered inputs with no degradation of audio quality.

Specifications: Power Requirements, 117 volts AC, 6 Watts, 60 Hz; Open Circuit Output Voltage, 49 volts DC (±1 volt); Output Circuit Impedance, 3.5k ohms; Maximum Output Current Per Channel, 14 mA; Ripple, Less than 0.05 mV (RMS); Microphone Input Connectors, Cannon XLR-3-13; Signal Outputs, Cannon XLR-3-14; External Power Output, Cannon XLR-3-13; Dimensions, 6-1/16"H x 5-1/8"W x 8-5/8" D; Unit Weight, 5 lbs. 2 ozs.

SUPERSCOPE, INC., 8150 VINELAND AVE., SUN VALLEY, CA.91352.

Circle No. 139

OPAMP LABS MICROPHONE INPUT MODULE KIT – MODEL 201K

Specifications: 8 push-on, push-off output assign push buttons. Momentary solo and mute push buttons. High frequency shelf equalization at 1.5KC, 3KC, 10KC with boost or cut steps of 2, 4, 6, 9, and 12 dB.

Low frequency shelf equalization at 40 CY., 100 CY., and 300 CY. with boost or cut steps of 2, 4, 6, 9, and 12 dB.

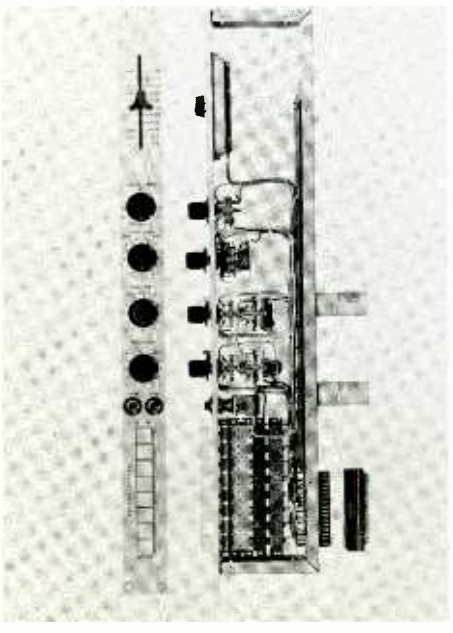
Echo send potentiometer with six pre and post assign positions.

Input level select switch with 0, -10, -20, -30dB attenuation steps and three line positions.

600 ohm mix potentiometer.

Microphone preamplifier Model 360BM with an equivalent input noise of -128 DBM is used.

Equalization amplifier Model 325EQ with an output of +24 DBM is used.



An optional line amplifier Model 425 may be used for extra high-gain applications.

For a mix-down unit only 325EQ amplifier is required. For recording studio use 360BM and 325EQ amplifiers are required.

Microphone input module kit Model 201K without octal plug-in amplifiers $200.00. Microphone preamplifier Model 360BM – $30.00. Equalization amplifier Model 325 EQ – $30.00. Line amplifier Model 425 – $25.00.

Model 325EQ – $30.00. Line amplifier Model 425 – $25.00.

OPAMP LABS INC., 172 S. ALTA VISTA BLVD., LOS ANGELES, CALIF. 90036.

Circle No. 140

GOTHAM AUDIO CORPORATION ANNOUNCES THE INTRODUCTION OF NEUMANN'S U-47 FET into their line of PHANTOM POWERED condenser microphones.

The NEUMANN U-47 fet is a cardioid condenser microphone designed for studio and concert hall use.

The new NEUMANN U-47 fet sounds like its famous predecessor because its head enclosure is just as it was 25 years ago.

What's new about it is everything that the state-of-the-art makes possible. It uses op amps, its capsule is specially isolated to prevent mechanical disturbances and its dynamic range is 136 dB – that's 50 dB better than the previous model!

It features a -10 dB overload protection switch between the capsule and its internal amp, a -6 dB switchable output pad to prevent console preamp overload on high levels and a low frequency proximity compensation switch.

GOTHAM AUDIO CORPORATION, 2 WEST 46 ST., NEW YORK, N.Y. 10036.

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AMPEX AG-300 ½" 4-Track and WIEGAND LABS 10 in, 4 out console, loaded w/extras. Rack, patchbays, EV mics (4), stands included. 2 years old. $8650. Tele-Matic Corp., Agent. Milwaukee, Wis. 414-342-2442.

Stellavox Portable Tape-Recorder 1½ yrs. old, hardly used, completely reworked at factory Nov. 71. Has 7.5 I.P.S. stereo head assembly, synchrotone equipped with built-in crystal. Accessories include 10½" reel adaptor, power-supply/charger, nicads, cables, leather carrying case. Sacrifice $1,850. Call 212-553-4012 days.

FOR SALE
6 each Spectra Sonics Model 700 Power Amps; 1 Model 505 800Hz electronic crossover, 1 Model 202P card holder with balance controls, 1 202 FP front panel, 1 202 RAP rear adapter panel, 1 402 RS power supply Complete bi-amp system, used 10 months — $650.00. Contact **Philip Miller — (213) 386-9819.**

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Wanted to sell the GARNER Model 202 high-speed professional audio tape copier. Makes five 1200 ft. copies in four minutes. Single capstan drives all tapes. Solid State electronics.

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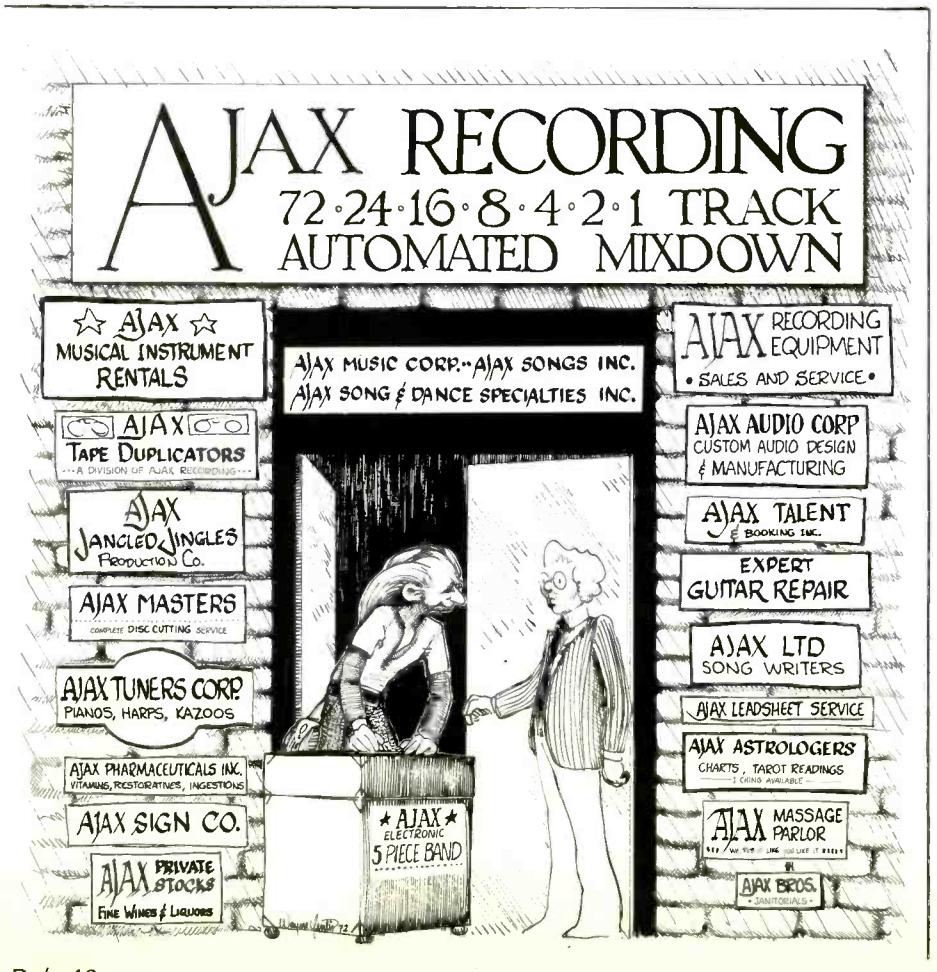

Circle No. 145

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ADVERTISERS INDEX

Now, another step forward by the leader.

Ampex MM-1100

An economical, compact, multichannel, high performance audio recorder/ reproducer.

As the leader in today's exciting sound revolution, Ampex has set the standards for fidelity, dependability, and flexibility in imaginative recording.

Now the MM-1100 fits solidly into the matchless Ampex family of multichannel recorders and reproducers.

For the budget-minded user there is the reliable AG-440-8, the lowest priced 8-channel recorder available.

The new MM-1100 fits the need in more demanding 8-channel applications, and also offers an entry into 16 or 24-channel recording at a cost much lower than for recorders of similar capability. Outstanding features include:

☐ Stable tape motion in 0.5 sec. from precision capstan servo.

☐ Tape tension servo for smooth handling of 10½" and 14" reels.

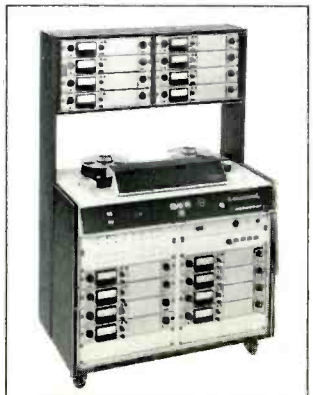
☐ Identical playback performance in both sel-sync and normal reproduce.

☐ Compact packaging for convenient mobility; functionally grouped transport and electronics controls; tilt-up meters.

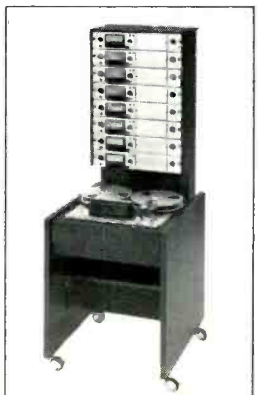
In performance, the MM-1100 is a no-compromise companion to the MM-1000.

Where very sophisticated mastering is the rule, the MM-1000 is unchallenged for flexibility and versatility. Capstan servo accessories for the MM-1000 allow precise locking to either film or video; permit variable speed control; and offer tape lock for absolute pitch stability.

There's an Ampex recorder/reproducer for any of your innovative ambitions. For complete information write: *National Sales Manager, Audio-Video Systems Division, Ampex Corporation, 401 Broadway, Redwood City, CA 94063.*



MM-1000 The ultimate audio recorder/reproducer. Available in 8, 16 or 24-channel models.



AG-440-8 Long known as the quiet professional. Lowest priced 8-channel recorder available.

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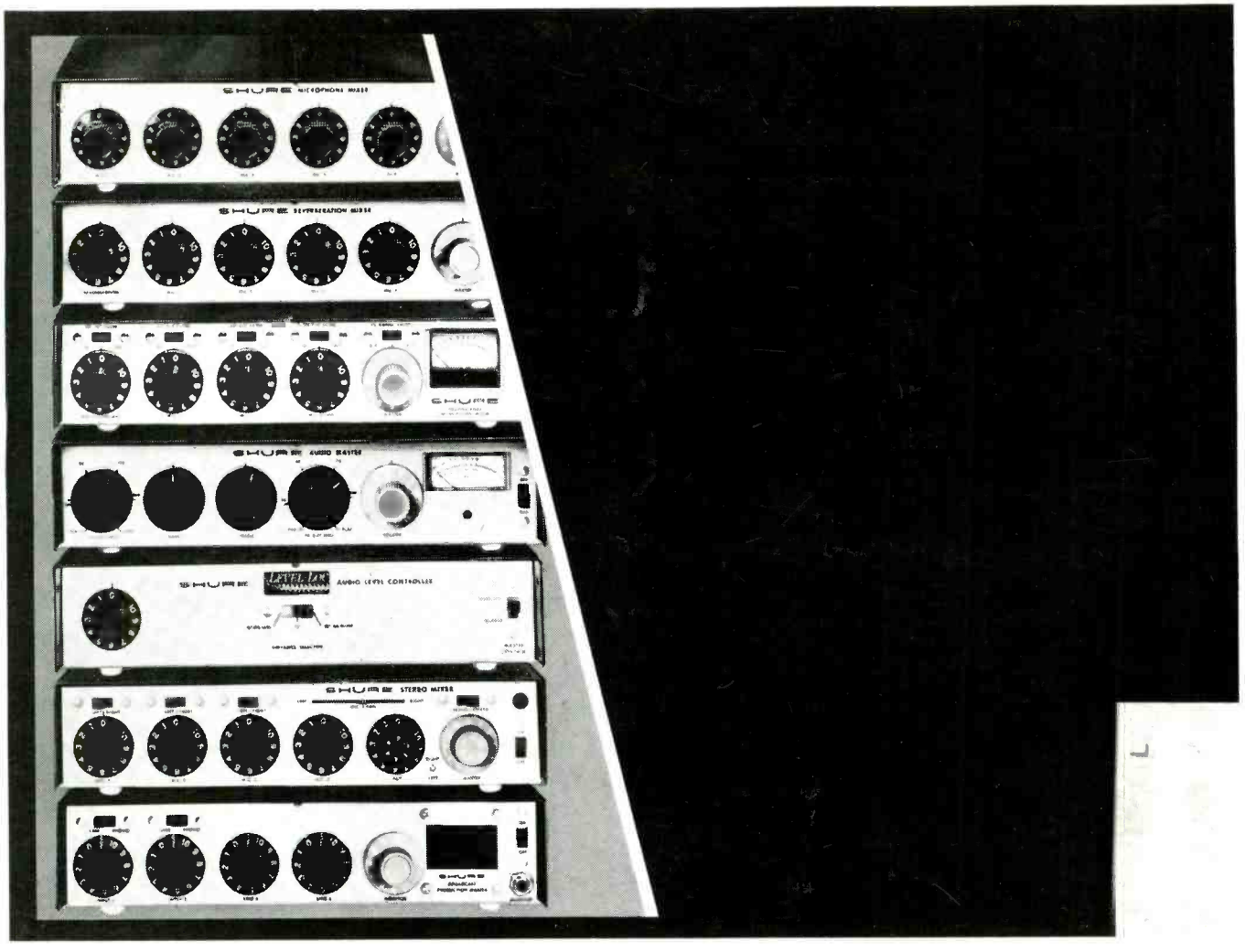

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