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In NEW APPROACHES TO IMPROVED TONAL REPRODUCTION, noted authority William Rheinfelder details the results of fifteen years of experimentation and circuit design aiming at better tonal reproduction. Part one of this two-part article is subtitled FILTERS FOR MUSIC RESEARCH. It will be concluded in September.

John Woram and Larry Zide visited Sound 80 in Minneapolis. Should you think that middle America lacks sophistication, use this db VISITS to dispel those thoughts.

And there will be our usual columnists: Norman H. Crowhurst, Martin Dickstein, and John Woram. Coming in **db**, The Sound Engineering Magazine.

ABOUT THE COVER

• This gaggle of microphones should tell you that this is a special microphone issue. How many of them can you identify? No prizes will be given even if you get them all.

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THE SOUND ENGINEERING MAGAZINE

JULY 1973 VOLUME 7 NUMBER 7

db is listed in **Current Contents: Engineering and Technology,**

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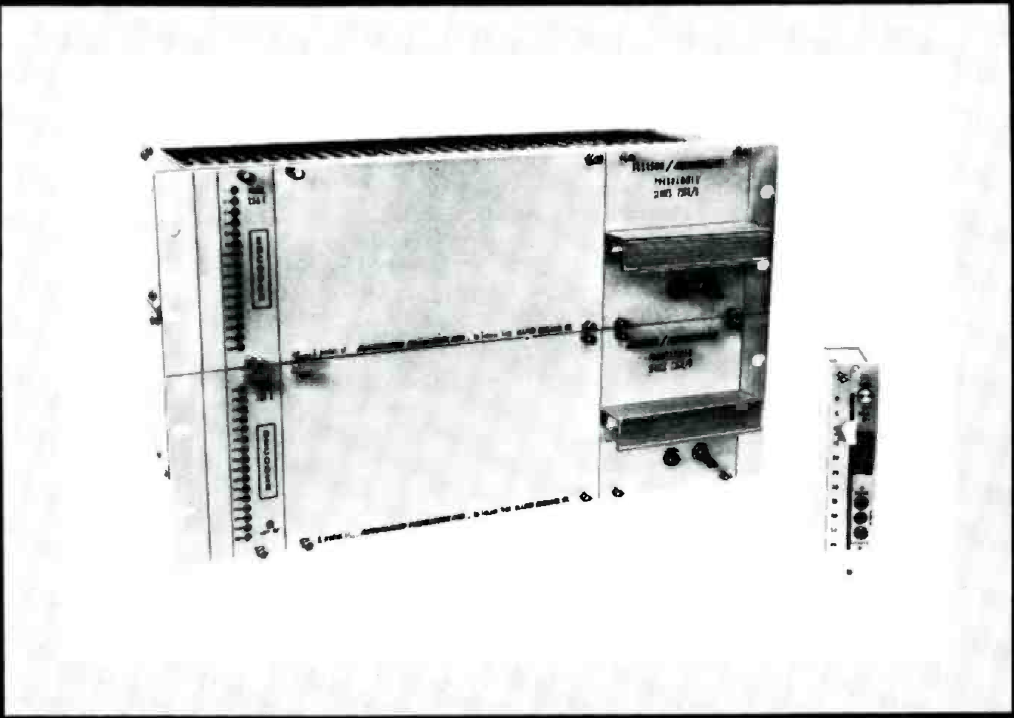

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John M. Woram

THE SYNC TRACK

● I've just finished editing Lou Burrough's book on microphones, which will be published shortly by Sagamore Publishing Company. While in the editing process, I had occasion to do a few medium-to-large size recording sessions. As best I could, I attempted to keep Lou's ideas in mind while recording, and found out once again how difficult it can be to convince people who should know better that doubling the number of microphones in use does not automatically improve the sound 100 per cent.

Here's a set-up that is typical of a few instrumental ("easy listening," non-rock style) sessions:

4 first violins	1 flute	tympani, concert drums
2 second violins	1 oboe	bells, triangle, cymbals, etc.
2 violas	1 bassoon	piano
2 celli	2 french horns	celeste
1 bass (acoustic)	1 harp	acoustic guitar

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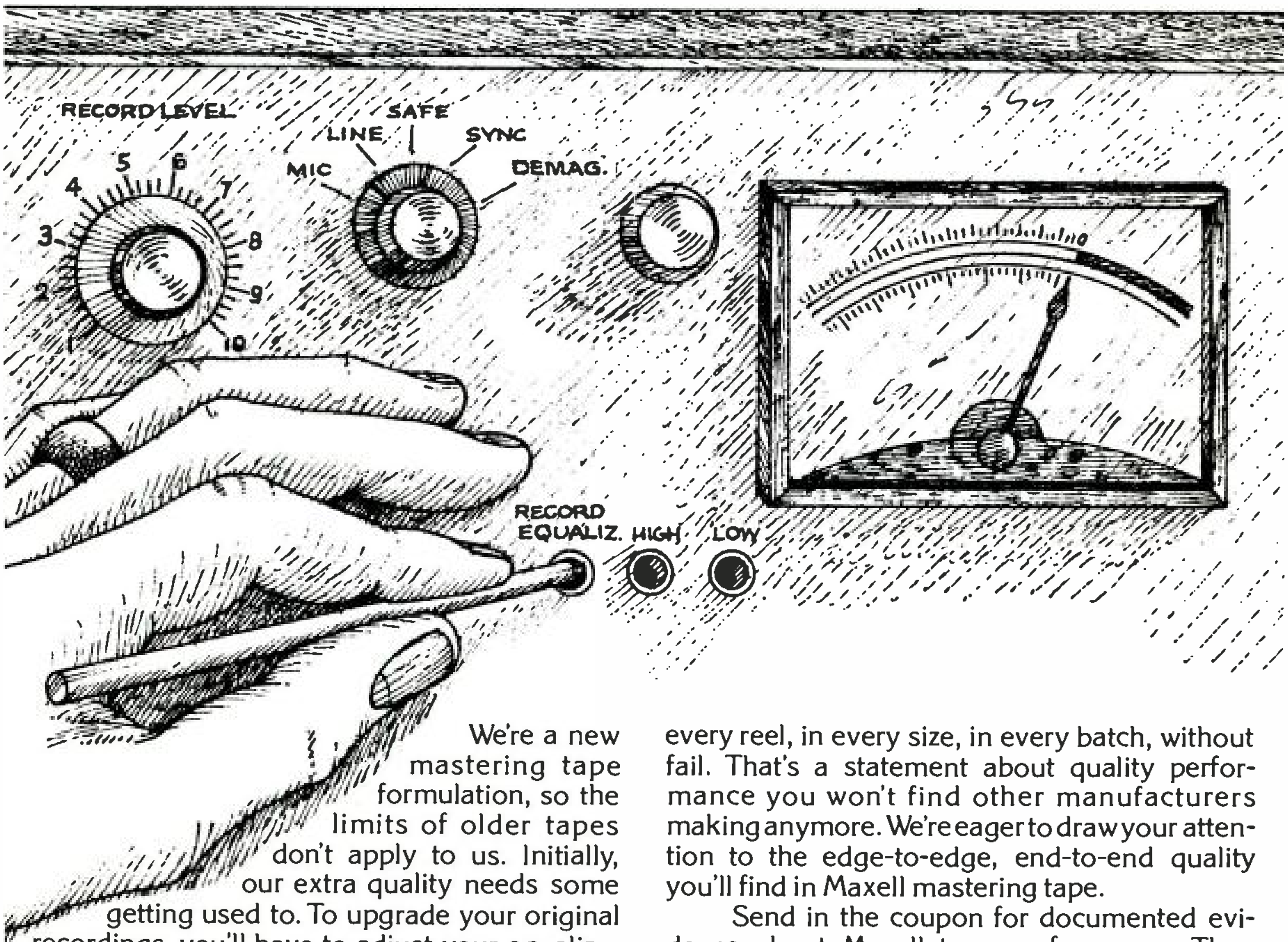

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The music was recorded all at once, with no sel-syncing later on.

I began with one microphone over the violins, and another over the violas, celli and bass. When the musicians came in, a few of them asked where "their" microphone was. And this was *before* they started playing:

I guess it's some sort of commentary on the triumph (?) of technology when a group of very talented studio musicians expect someone else to take care of their 'ensemble.' Certainly they were equal to the task, but through years of multi-track mono recording sessions, had grown so accustomed to working under a forest of microphone booms that they were surprised to find so few microphones in place.

I remember how concerned the percussionist was when he discovered only two microphones above his array of tympani, bells, drums, and what not.

Things didn't improve much when the conductor looked over the set-up. Among other things, he thought we should have a microphone for *each* wind player, rather than just one above the entire section.

I'm sure we came dangerously close to hysteria during the first playback when we could not hear—among other things; the second violins, the flute, bassoon, violas and bass. The conductor said he hadn't heard them while recording either, but naturally assumed we were picking them up all right on the tape. What went wrong, he demanded to know.

Now that's a very good question. What *did* go wrong? Before answering it, we should really ask another question;

Who is *supposed* to conduct the orchestra [Choose one only]

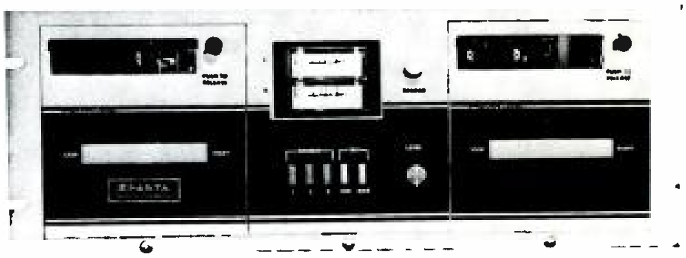
a. the conductor

b. the engineer

If you think the right answer is "a," the next question is, why can't the conductor hear the missing instruments? If the right answer is "b," the next question is simply, *why?*

I hope we can all agree that the right answer is "a," yet too many times the conductor will look to the engineer when the playback isn't perfect. And yet, the conductor is probably the only one in the studio with a complete score—and if it's a typical contemporary session—he probably did the arrangements himself. So, he not only holds the score in hand, he also wrote it. But he will *really* believe it is bad engineering that prevents him from hearing the right balance.

It's no great technological feat to put up a microphone in front of each



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instrument. In fact this is usually the best method on a rock date. It gives the engineer complete control, and allows for all sorts of creative signal processing later on. But, how much *control* should the engineer be given on a session such as the one we are describing?

Every time the engineer assumes a little more control, someone else gives up some. Yet even with complete control over each instrument, the engineer must still guess a bit about balances, since he certainly doesn't know the music as well as the conductor. In fact, he is probably the only one in the studio who has no music at all to follow. But, if one still insists on taking the conducting chores into the control room, a lot of artistic concessions must be made.

For example, two violas don't make much noise. In order to get anything even approaching good separation, each would have to be miked very close-up. Have you ever heard two violas miked very close? It's not unlistenable, but it certainly isn't very pleasant. Yes, you can add echo later on, and a little equalization may help too. Of course, it will never sound as good as two violas played in ensemble with the rest of the string section, but then you can't have everything. You've got to make these concessions.

Or must you? What if the conductor, and the musicians, were to do the balancing themselves? This is known as "music," and is really not a bad idea. It places the control where it belongs; in the hands of the musicians.

Actually, the engineer can never have total control over the orchestra, since he is—no matter how musically proficient—a member of the audience. He has absolutely no power over what the musicians do. He must wait until they play, react, and then twiddle a knob or two. The musicians do not react to his adjustments at all. They *do* react (hopefully!) to the conducor. So much the worse if the engineer is attempting to conduct too.

Both engineer and conductor hear a too-loud entrance from the French horns. Next time around, the engineer brilliantly lowers the gain on the horn input. Surprise! The conductor, also brilliant, has signaled the horns to enter at a lower level. The engineer stops the tape, explaining that he didn't get enough horn entrance. On the re-take, he brings up the gain. The conductor, being considerate, meanwhile has the horns play their entrance louder this time.

So that this doesn't go on all day, a quick conference is held.

"I thought you were going to take that entrance down a bit."

"I thought *you* were going to fix it inside."

"Do you want me to?"

"No, I guess I can do it out here."

Which is what should have been happening from the beginning of the session.

I suppose by now I've made the point that if the conductor doesn't hear the proper balance, he is in a far better position to make corrections than is the engineer. Of course, this assumes that the orchestration does not exceed the limitations of the orchestra. If the acoustic guitar *must* be louder than the tympani, of course it will be up to the engineer to achieve this unlikely balance. However, this would certainly be a unique situation. But because such demands are from time to time imposed on a recording, there is no reason to conduct the entire session as though the conductor, and musicians, were incapable of making artistic judgments.

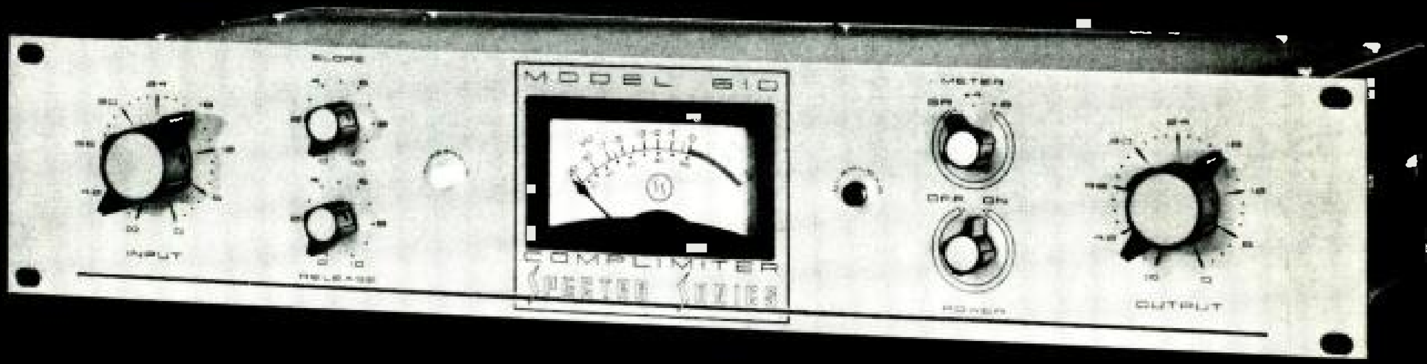
Meanwhile, back at the session's playback, it was hardly the time to start philosiphysing over the responsibilities of the various principals. We made a few seating changes, and put up some extra microphones, a few of which were left unconnected. And, I told the wind players that I was having a little trouble with the console, and it would help if they would balance themselves in front of one microphone. Needless to say, they did a better job in minutes than I could have done. Not only that, the musical lines came across far more effectively.

Later on, during mixdown, the conductor was a little concerned about a few cello lines that didn't project enough. But he really liked the overall quality of the mix. And no wonder! He did most of it himself, on the session.

So, in the end I got a lot of credit for doing a good engineering job. Actually, the credit should have gone to the musicians who responded to the music and did not depend on others to help them out. My engineering consisted of putting up a few microphones, keeping the tape from becoming saturated, and otherwise staying out of the way. By using fewer microphones, I had been able to spend more time concentrating on the overall effect of the complete recording. Which is pretty much what Lou Burroughs has been teaching for years.

Don't use more microphones than you need. Each one is a potential source of interference and coloration. It's not always easy to convince people who are spending a lot of money recording that they can get better results with less microphones, but as Lou says, "Prove it to yourself. You'll be surprised at the improvement in your work." ■

NUMBER 1!



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Norman H. Crowhurst

THEORY AND PRACTICE

• My recent writings about education, and the use of A-V materials intelligently therefor, have elicited three types of response. There are those who feel that I threaten teachers, and am recommending that technology can do a better job than a human teacher can. There are those who seem to think I am espousing the individualized instruction that is rapidly becoming the vogue, and who believe that such technology really is an improvement on the old-fashioned human teacher. And finally, there are those who do seem to get the gist of what I am trying to say.

So let me explore some of these angles. First, since this *is* a sound engineering publication, let me explore the uses to which various new systems in the technology can be put. In tackling this, I will not venture into Martin Dickstein's "Sound with Images" field, intriguing though I find the study of all the new things that can be done. What concerns me is how these things get used.

Some time ago, I attended a typical demonstration of one of the more sophisticated systems which provided multiple track audio with pictures and could be programmed so a student could follow a branched program. A short way into the monolog, the narrator asked the "student" to identify which of four names was the "father of modern educational psychology:" Thomas Edison, Albert Einstein, Bertrand Russell or B. F. Skinner. As the narrator said each name, a picture of that individual flashed on the screen.

Then the four faces, with their names, appeared on screen at once, while the audio told the "student" to push button A, B, C or D, according to his choice of answer. If he pushed button A, B or C, the programmed material gave him a quick run down about who the man was whom he had selected, and then returned to the four faces again, suggesting he try a different selection. When he selected button D, he was told this was the correct answer, and the program continued.

One concluded, inescapably as far as this program was concerned, that B. F. Skinner has opened up the whole new "magic" of better education! Why should I criticize that? In the first place, this was an enormously costly way of handling what could have been done as effectively with a simple multiple-choice questionnaire.

It might be argued that it is good to tell the student the truth about his wrong answers. If he had tried a wrong method of solving an equation, that would lead him to a wrong answer, I would agree. But all the peripheral information about irrelevant answers that were only guesses does not seem to contribute to useful learning. The kind of student who would try all the wrong answers, simply because he did not know, could not possibly be expected to remember all this extra peripheral information!

More important, in my mind, was the authoritarian handling of matter which at best is a matter of opinion. *If* the brave new education, towards which we are moving, does consist of behavior modification, so "learners" acquire the ability to give correct responses, as required by the system, then answer D was correct. But that "if" was not open for discussion!

Not all new materials are built on B. F. Skinner's theories of learning, of course. But most of them are just as much "single track," whatever that track may be. Very few make any attempt to help the student learn according to the way he responds. In some instances, a number of different responses may be equally valid ways to approach the solution to the problem being posed. A good branching program would allow each student to pursue whichever approach he prefers, and, if he wants to, reinforce that by using others.

Also, in many instances, incorrect responses, if the material is well designed, will have a reason or basis: some incorrect association of ideas or thought process, that needs correcting. Such an incorrect "path" may have started with correct information or ideas, but gotten "off track" somewhere. In short, with a little care, it can be turned to reinforcement too, instead of mere identification of an incorrect answer.

My main criticism of all this kind of material is that it is essentially "one track." The student must learn a prescribed sequence of instruction, with very little choice of how he learns any step of it. "Individualization," in this context, means nothing more than allowing the student to progress through the prescribed material *at his own rate*.

This, in essence, is the "tremendous" advance made possible by all these various systems brought to us by modern technology! In my head, the fact that this is recognized as an advance at all only reflects how bad the system has become. So what I say next will answer those who think I advocate technology "taking over" from teachers.

To provide context for this, let me try to tell you what happens in a classroom where I am teaching. And I have observed essentially the same thing, but with as many variations as teachers with whom I have observed it, with every really good teacher it has been my good fortune to see in action.

First, I do as little "lecturing" as possible. I am there to respond, not to lecture, which kind of inverts the usual model. As soon as possible, I want to get my students to let me know what it is they want to find out. Then, I never *tell* them. It will only do them lasting good if they find it out for themselves. So my next objective is to see exactly where they are and what, if any, are the obstacles in their way.

In my classroom, there is usually plenty of dialog going on. My attention is devoted to monitoring as much as possible of the communication, both verbal and non-verbal (such as frowns, looks of sudden enlightenment) around the room. But in my head, that monitoring itself is merely a communication, not the end. What I really try to observe, are the mental processes going on in all those heads.

A tall order? Not really. Because I have a valuable ally: once I get the thing started, they all want to learn. They all bring different personalities and prior experiences to the situation, and I can let them do, probably 99 percent of the learning, among themselves. My attention is devoted to just being sure that none of them gets stuck at a seemingly insurmountable "road block."

If I followed the prevalent educational notion of trying to put out enough "stuff" so that everybody in my class could learn, it would be no easier for me than for anyone else, to insure that all do learn. But by moving to the opposite role, of getting learning going, so I only have to be concerned when it *doesn't* happen, I find it quite easy to be sure that everyone in the class learns.

There are many bonuses to this general method of operation. The fact that students learn in different ways leads to synergetic interaction, large scale reinforcement of learning, and a rate of progress, class-wide, that exceeds the other method several times over. In such a class, fast and slow learners seem to vanish as separate entities because they are all helping one another. But I must cut short the list of bonuses.

Maybe, some day, a really "smart" computer will be able to do the kind of thing that any good teacher can do. Really, I doubt it. Because that capability springs from *experience*, from learning to recognize how people think. Even then, if it was *only* experience, you'd never have enough. You also need empathy: a capability to listen to others and, from what they say, and their non-verbal communications, to discover their way of thinking, and where they are, *even when that happens to differ from any previous situation you have encountered.*

That, in my mind, is the essence of why good teachers will never be supplanteu by machines—why, rather, we drastically need a lot more good teachers.

A good teacher is *not* required to know everything the students wil learn in that teacher's class. I have seen some dramatic instances to support this statement. The good teacher's capability can be summed up as knowing how learning happens, in a variety of different human beings, and being competent at causing it to happen.

Students can learn a lot from modern technological systems. But these should always be resources, not sources. The initiative should come from the student, not the machine. There are ways, which I have explored with considerable success, in which a well designed course can gradually transfer the initiative from the machine to the student, even when the student seems void of initiative.

But if that is *all* we can do, I would despair of ever getting education out of the hole it is in. It is a help. As has been found, individualized instruction that is not even that good, can do better than much that passes for teaching. That only shows what a long way we have to go! The best learning happens when a number of people come together in a class, when all of them are turned on to learning, when they work individually and collectively, complementing each other with the resulting synergy. The best "individualized instruction" ever made can never approach that, although it could contribute to it.

Here, as in the March issue, we are talking about a new role for teachers—a truly professional role. I am pleased to report that a new organization was formed a little over a year ago, called the National Association of Professional Educators (NAPE). Headquarters are at 223 Thousand Oaks Blvd., Suite 425, Thousand Oaks, California 91360. This group is holding its first national convention in Denver, August 15-17, at the Denver Holiday Inn.

While I was talking over plans with the president, Richard Mason, he invited me to put together some outline headings to form a basis for the professionalism aspect of the convention. I have divided this into: changes in curriculum, changes in functional role, and changes in measurement, each of which represents a whole area requiring detailed attention, if the kind of objectives we have been talking about are ever to be achieved.

Changes in curriculum must relate to acquired abilities in learning, and ways to speed that up, rather than to an ever expanding conglomeration of facts and skills, to be retained, and usually forgotten!

The functional role of the professional must become that of helping students to acquire learning habits and ways of finding out, rather than addressing the purely rote retention methods that should by now be obsolete, since computers do it without any training!

And measurement is the key to effective grading, or monitoring of students' progress. Standardized tests, in which students' acquisition of facts and skills depends on how well their classwork has prepared them to respond, are no indication of acquired learning capability. *But the latter can and must be measured.*

Most traditional educators will quickly assert that it is not possible to measure the ability of a student to utilize learning cues in a self-motivated situation, that only the results can be measured. But during the last year, my work has verified that it can be done, in a wide variety of contexts, for which there is not sufficient space here to go into in detail. This has confirmed my earlier experience, when I was so green that I just did it, simply because nobody had yet told me I couldn't. It may be impossible, or very difficult, within the existing framework of standardized tests, but when learning and testing are properly integrated so the student wants to find out what he can do on his own—i.e. without having been shown what to do—then it becomes simply a matter of measuring his capability of doing just that.

This whole procedure needs to become the accepted way, part of every professional teacher's "bag of tools," something that any other truly qualified professional can readily verify. NAPE would appear to be an excellent vehicle for disseminating this capability, as part of what constitutes professionalism. By gaining wider membership, it can then influence the system in ways the U.S. Office of Education, its programs, and its agencies have totally failed to do. ■

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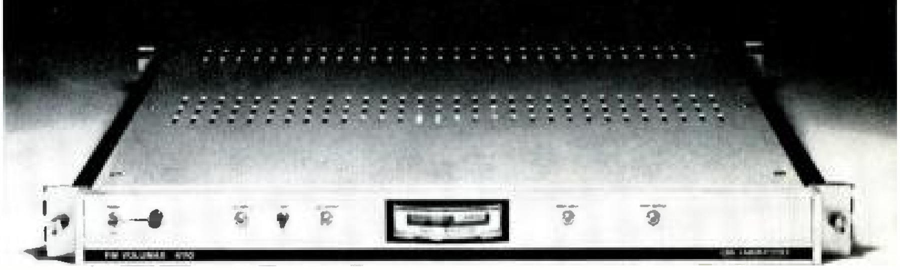

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Martin Dickstein

SOUND WITH IMAGES

• Many times, an audio/visual equipment dealer will sell equipment with or without instructions to the customer (or client or industrial user) on how to prevent trouble during operation. During a recent discussion among several a/v users, this subject came up and several interesting comments were made on methods of preventing trouble in different types of equipment. Perhaps a quick general synopsis can prove valuable to some of you who had not thought about the subject in some time and to others who have.

The audio tape recorder seems to be in use almost everywhere. Some of the tricks used to keep one type going for a long time with satisfactory service can be applied to others. For example, the cleaning of the heads This is a very simple operation and takes very little time but can be extremely important in keeping the machine working well for a long time.

As most good audio men know, if the head gap gets dirty, the result is bad sound output or recording. Quality drops, sound level drops, and sometimes after the user gets the bill from the service man, his face drops. The user is sometimes not aware that the whole trouble might have originated with a dirty head, and then, when he learns this, he may figure he can use any liqiud to clean the head. On the home and industrial open-reel type it might be permissible to use a professional head-cleaner solution.

This is rather strong and will dissolve china-marker and marking-pen marks very nicely on heads as well as on tape reels, but it will also dissolve part of the tape reel plastic, rubber rollers, and will seriously damage the tape itself. For this reason, this liquid should *only* be used by those who can appreciate the good it can do as well as the damage it can cause. It should *not* be applied to heads on the cassette machines since the plastic around the head can be ruined in no time at all. Also, the liquid, as quickly as it may evaporate, should be allowed to dry completely before putting the tape around the head. Care should also be taken to keep the fluid off the rubber and plastic parts and also the little felt pads that press the tape against the heads. (And speaking of pads, it is important that the pads be replaced before they wear out completely or fall off. Strong solutions can harden the felt and even dissolve the glue holding the pads.)

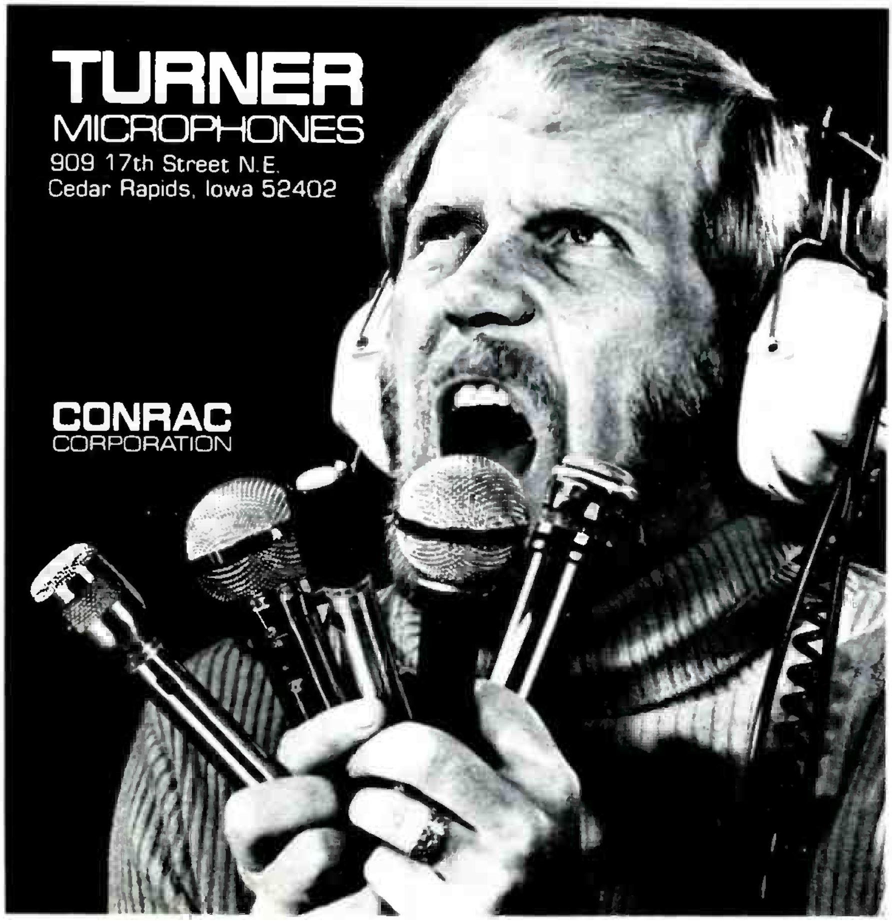
According to those who know, and this includes the operating instructions that come with the tape recorders (the thing that is read when all else fails), the solution to use is ordinary alcohol. This will not damage rubber rollers and is recommended for all tape recorders. The cleaning process should be performed carefully with a cotton swab or lintless cloth. The liquid should be allowed to dry thoroughly before putting the tape on the machine. (Alcohol can be used on rubber parts and plastic, too.)

Of course, the same procedure and technique is applicable to the reel-to-reel video tape recorders, but with several precautions. The procedure used with stationary audio and sync track heads is the same as that followed with an audio tape recorder, but when dealing with the rotating video head, there is a problem. The head projects only a very small part of an inch (to allow tape contact, but prevent cutting into the tape), but this small edge is sharp. If a cotton swab is applied to the head while it is rotating, it is possible to dislodge the head or to catch a piece of the cotton and cause poor quality video output or none at all. One must be cautious about this.

Then there's the tape itself. During the handling of tape in audio editing, oils from the fingers get on the tape, as well as the splicing tape. Sometimes this can cause a bad juncture, which, if the splicing tape rolls up, can catch on the head or the guide roller and cause trouble. Marking the tape with a magic marker or china pencil during the editing process can cause fluid or wax to get on the head or other parts that come in contact with the tape. (If the marking of the tape is done directly over the head, the wax will collect on the head.) The ink of the marking pencil or the wax can also collect on the tape and rub off on the adjacent layer of tape during winding, causing trouble during replay.

The same situations can also occur in the playing of video tape. Editing for fingerprints and markings is similar to examining audio tape; in the two-inch systems, special powder is used to show up magnetization patterns on the tape. This powder (and the wax and oils) can also get on adjacent tape layers and heads, causing video dropouts. Cleaning of video tapes (brushing off excess powder, for example) and heads must be careful, lintless, and thorough to keep machines working satisfactorily for extended periods of time. (Editing in white gloves is one recommendation.)

One cause for trouble which is not familiar to the uninitiated is the adhesive material used to hold the end of the audio or video tape after complete rewinding. Usually a piece of splicing or masking or Scotch or any other kind of tape is used to keep the end of the audio tape from unravelling. When the first layer of audio or video tape is unrolled for play, with the adhesive tape still attached, the stuck-on tape can be used to hold the playing tape to the take-up reel. No problem so far. However, when the tape is rewound after play, the sticky tape does not always go through the machine cleanly. Sometimes, it catches on the capstan or the roller or the head and stays there, unnoticed by the user. The next time the machine is used, there is trouble of one kind or another. This same problem can occur in reel-to-reel video machines, too, and often with more costly results. (With cassettes, it is unlikely that this situation can occur, since the tape itself is not handled and is securely



fastened at both ends.)

Another cause for trouble, usually not mentioned until it's too late, is the ventilation of the tape machine. Most of them draw the outside air into the machine through vents, usually on the sides or bottom of the machine. This automatically puts a definite stipulation on the placement of the machine and the surroundings.

First, it would seem logical that the ambient air in the vicinity of the tape recorder should be cold or cool to help keep the machine from heating up. Of course, with solid state units the machine itself will not heat up as much as it did when it had tubes, but the electronics and motor can still work better and safer if the intake air is cool. This means keeping it away from other devices, such as slide projectors, which exhaust hot air.

The air should also be clean. Placing the machine in or near dust and allowing it to take up the dirt particles with the intake air is mechanical murder to belts, motors, relays, and a host of other moving and electrical parts, including the heads.

The machine should also be placed to permit the air to circulate through and around the machine. If the vents are on the sides of the unit, nothing should be near enough to prevent air from moving freely in or out of the recorder. This is especially true of the bottom of the machine, through which many units take in cooling air. This means that the unit should be placed on a firm surface, so that some space is available under the machine for the air to move in freely. Many times, unthinkingly, the machine will be placed in a soft chair or on a carpeted floor. Not only will this prevent freely flowing air from entering the machine, but dirt and dust particles in the soft materials will enter the machine with what little air gets through. It does not take long for moving or rotating parts, such as the fan blades and rubber belts, to get full of crud. Result—an overheated machine and some parts to be replaced. The parts may be inexpensive, but the labor cost for time of servicing and the down-time of the machine may make the user wish he had not put the machine down unthinkingly.

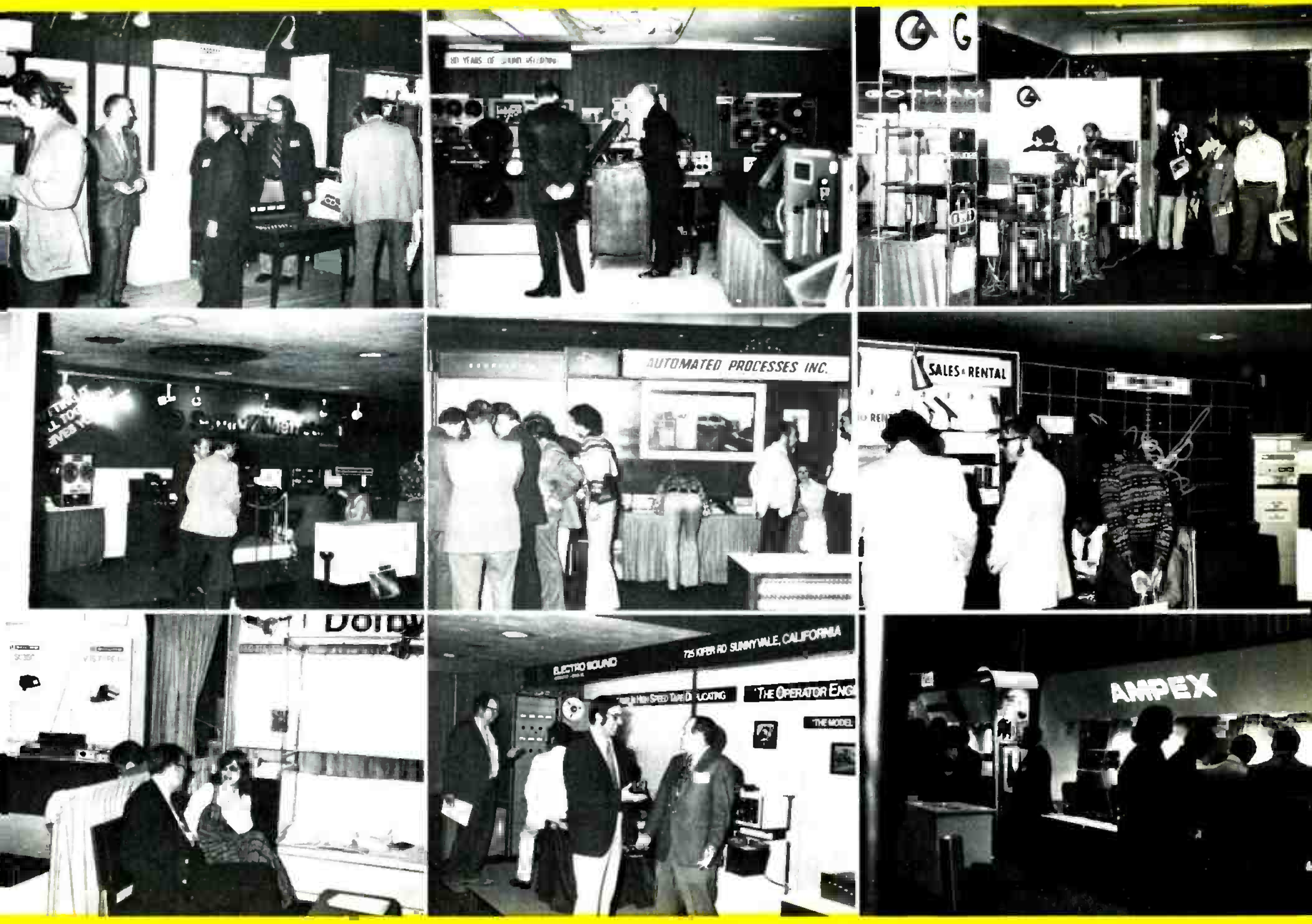
Whatever has been said about cooling of the tape machine holds as well for video machines as well. With t.v. tape players there are a few other precautions to be taken into consideration. On some open-reel machines there is danger from the strong suction around the tape head of sucking in dust and dirt and also small parts

Continued on page 21

Picture Gallery— 45th AES Convention

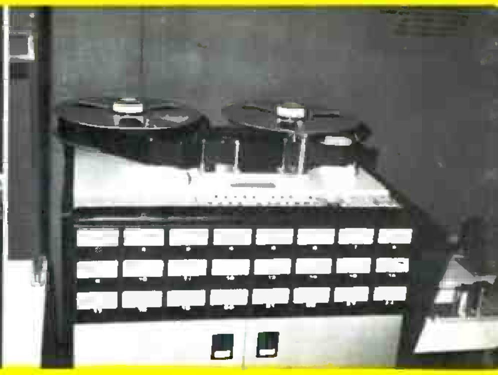
Los Angeles' L. A. Hilton was host to the convention held May 15 through May 18. As usual, our camera lens was there and came away with the pictures shown on these pages. If you want detailed information on any of the products shown, circle the appropriate number on the reader service card at the rear of this issue. Material will be forthcoming directly from the manufacturer or distributor.

VIEWS AROUND THE SHOW



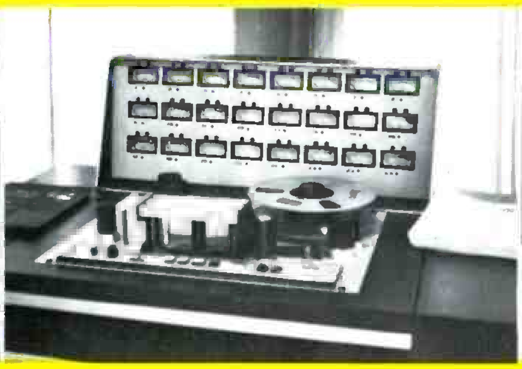
How about eight channels on a half-inch tape, from a console machine of low cost. Tascam has it. Circle 66 on Reader Service Card.

A great deal of innovative design appears to be in Xedit's 8/16/24 track machine. Circle 76 on Reader Service Card.



Newest multi-track machine from Ampex is the MM-1100 shown here as a twenty-four track. Circle 61 on Reader Service Card.

Stephens once more showed their capstanless tape drive system with 40 tracks. Circle 90 on Reader Service Card.



Twenty-four tracks on two-inch tape are laid on this MCI-made machine. Circle 88 on Reader Service Card.

One of the most crowded exhibits was where API demonstrated their Maglink sync system. Circle 69 on Reader Service Card.

Custom Fidelity showed a sixteen-track machine that was sophisticated and compact. Circle 52 on Reader Service Card.

Dictaphone's newest recorder is the Scully 280-B four track model. Circle 51 on Reader Service Card.

Electrosound is very much in the tape business with this two-track ES 505. Circle 53 on Reader Service Card.

The Audiotechniques booth had this L. J. Scully machine with adjustable advance system. Circle 92 on Reader Service Card.

Open reel to open reel masters and slaves are only part of the duplication equipment made by Pentagon. Circle 65 on Reader Service Card.

Telefunken-Neumann's unit has stereo preview. It was shown at the Gotham Audio booth. Circle 54 on Reader Service Card.

A broad line of duplicating equipment, including this open reel master, is available from Infonics. Circle 55 on Reader Service Card.

This clever little device by Tentel measures the tension under which a tape operates. Circle 84 on Reader Service Card.

Brand new from Beyer Microphones is the M201. This is a super cardioid dynamic mic. Circle 74 on Reader Service Card.

Recortec makes this bi-directional duplicating master which feeds a loader and slaves. Circle 99 on Reader Service Card.

Variable speed can be important as a tape tool. Multisync's MDA-18 can provide this. Circle 67 on Reader Service Card.

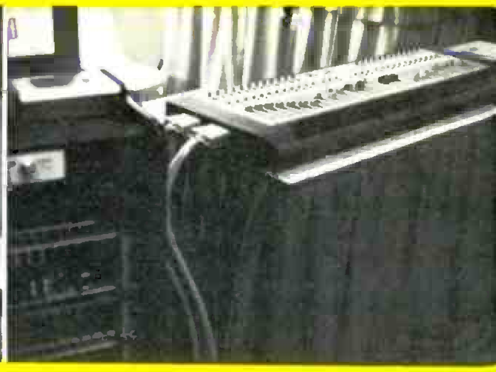
Shure's model SM7 unidirectional cardioid was shown in cutaway form. Circle 77 on Reader Service Card.

Latest from Electro-Voice is the dynamic DL 42 a unidirectional special purpose mic. Circle 47 on Reader Service Card.

Sennheiser continues to offer a wide variety of microphones for the profession. Circle 56 on Reader Service Card.

Audio Devices has repackaged and come up with new tapes to serve professional audio and video. Circle 87 on Reader Service Card.

Electronic delay lines and all-electronic phaser systems are offered by Eventide Clock Works. Circle 64 on Reader Service Card.



Compumix from Quad-Eight is an add-on device for automated memory mixdown operation. Circle 98 on Reader Service Card.

Sansui was there to show and demonstrate their matrix encoding and decoding equipment. Circle 79 on Reader Service Card.

Noted authority Don Davis had booth space for his Syn Aud Con where he demonstrated the education methods he uses. Circle 73 on Reader Service Card.

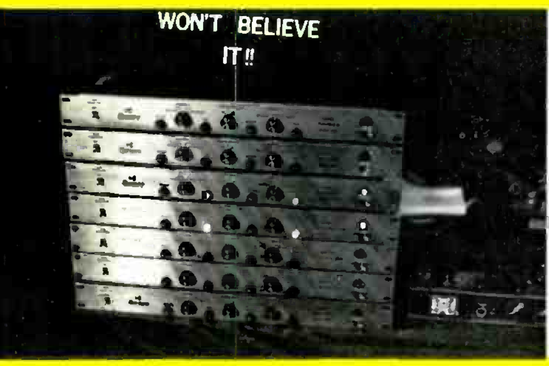
Sixteen channels of record and play noise reduction are available in this new dbx unit. Circle 58 on Reader Service Card.

This equalization system from ITI is extremely versatile in this module form. Circle 57 on Reader Service Card.

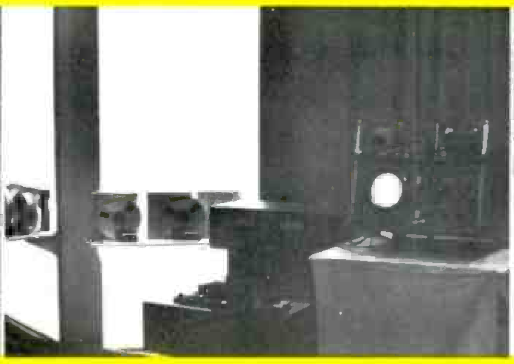
Interface showed this modular board of Lumiere Productions of San Francisco. Circle 91 on Reader Service Card

Harvey Radio had this Interface portable mixer on display in their booth. Circle 78 on Reader Service Card.

There will be many more new products as seen at the Los Angeles AES Convention in the August issue.



Effective demonstrations were given of the Burwen noise reduction system. Circle 48 on Reader Service Card.



Maxell put on a display to show the effectiveness of their line of mastering tape. Circle 95 on Reader Service Card.

Magnetic Reference Labs, MRL, make a complete line of alignment and testing tapes. Circle 83 on Reader Service Card.

from page 16

of tape ends that may have broken off when the tape was rewound too quickly and the ends snapped around a few times. Even if the machine has an automatic cut-off when the tape runs off, there is the possibility that small particles of the tape end will break off as it comes around the head and guides at top speed. These particles can easily be seen either on top of the machine, or down under in the works and electronics when the top plate is removed. The tape should not be permitted to spin off at top speed, but should be stopped or slowed down before the end snaps off. This will also protect the tape, the rotating head, and the delicate guides which keep the tape in alignment. (If a thin guide metal develops a burr or sharp edge, it can cut the tape to ribbons.)

Although it is necessary to keep audio tape in a cool dry place when not in use, and in a clean area when it is being used, this is even more essential with video tape since picture drop-outs are more obvious to the eye than sound drop-outs are to the ear. This is also true in the case of video cassette units. With audio tape machines, it is almost impossible to put anything on top of a machine that is placed horizontally during operation because of the tape reels and the path of tape movement. On video cassette machines, however, there is sometimes a space behind the front operating part which lends itself nicely for placing half-empty coffee cups, full ash trays, and partly eaten sandwiches and pastries. The open vents in this space are for aid in cooling the machine but will also permit the crumbs and liquids to enter and foul up the working parts and electronics. It is strongly suggested that the top of machines like this be kept clean for a healthier and happier tape machine (and operator).

The discussion mentioned at the beginning of these notes also brought up the subject of spray cleaners for heads, problems with different types of tape, the need for frequent and proper head demagnetization, and the head cleaning tape now available for video cassette machines. It would be greatly appreciated if you would share your experiences on the problems discussed, and some of the techniques you use to remedy hazardous situations, by writing to us. Your comments will be passed along right here.

Also discussed were problems with film equipment and projectors for slides and strips. These will be the subject next time. ■

LOU BURROUGHS

Determining an Imperfect Microphone

If you think that microphone you have is not quite right, read this and learn how you can test it even though you don't have an anechoic chamber and elaborate test gear.

THERE ARE, no doubt, many of you wishing there were a means of easily spotting degraded microphones. I have had users of large quantities of microphones, such as t.v. networks, ask for information on anechoic chamber and curve tracing equipment, with the idea of duplicating it. This equipment *would* supply the answer, but costs many thousands of dollars. It would supply little useful information that could not also be obtained through the use of equipment available in all studios equipped with multi-channel consoles.

Here is a way to sort microphones that will, for all practical purposes, verify their responses. Equipment required is as shown in FIGURE 1. This test is one of comparison. The comparison standard must be a new microphone or one known to be in like-new condition, and both units must be of the same make and model number.

Locate the microphones on the console or in a position where they may be spoken into at a distance of approximately one foot and directly between them where the gain controls may be reached and the meter seen without changing position when speaking.

Mount the two microphones side by side as shown, with little or no space between them. Place the one to be used as the test standard in (A) position. Connect each to a separate mixer channel. Connect microphone (A) to channel (A), using a normal microphone cable. Connect microphone (B) to channel (B), with a cable wired electrically out of phase with (A). The two channels are then fed to a one volume-level meter.

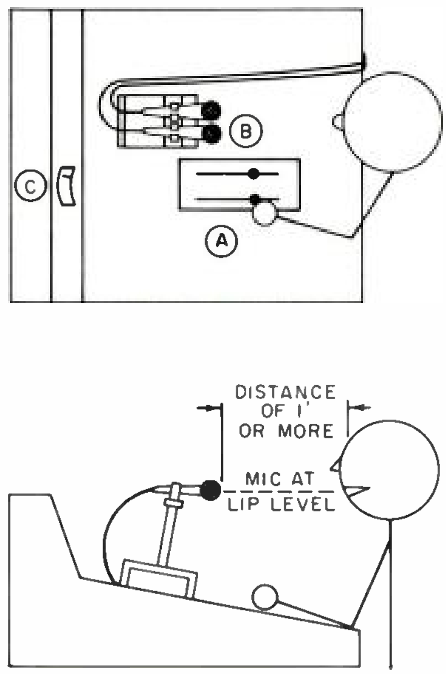
Begin the test by setting both controls in "off" position. Then, saying "one . . . one . . . one" over and over, advance gain control (A) until the meter reads zero. Repeat, saying "one" with sufficient rapidity to maintain voice level easily. This is very important. When level at zero has been established, turn off gain control (A) and repeat the procedure with (B). Do not stop talking until the test is complete. When you have established the level of both microphones at zero, turn them both on at this level. If the response of the two is a near match, the level on the meter will have dropped below −15 dB. The closer the match, the more the level will drop. When the meter indicates above −15 dB, the response is sufficiently mismatched to warrant its return for service. (A) in FIGURE 3 shows the laboratory curves of two microphones of the same model having a diameter of one and a half inches. These were run individually and overlaid to show their uniformity. When two units with this uniformity of response are mounted side by side and connected electrically out of phase, the resulting response will be as in curve (B).

For making microphone tests in the field, assemble the out-of-phase cable as in FIGURE 4. Whenever a microphone is in doubt, connect it to one leg and another unit of known response to the other. By holding them together, a quick oral test can be made simply by having someone listen to the result.

Before purchasing a microphone, particularly if it happens to be one with which you have had no past experience, make certain the specifications or claims for the microphone live up to your expectations. If the following tests are conducted carefully, the answers received will

Lou Burroughs neeeds no introduction to users of professional microphones. This article is an excerpt from one chapter of his forthcoming definitive microphone book. Watch for the announcement of it next month.

Figure 1. The test jig that should be used to hold two microphones for testing.



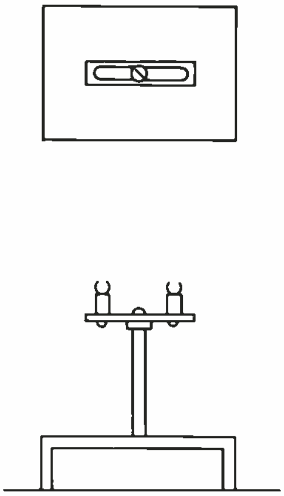


Figure 2. This set up is used to verify the performance characteristics of microphones.

Figure 3. At (A) is shown the frequency response curves for two similar microphones. At (B) is shown the same mics combined out of phase.

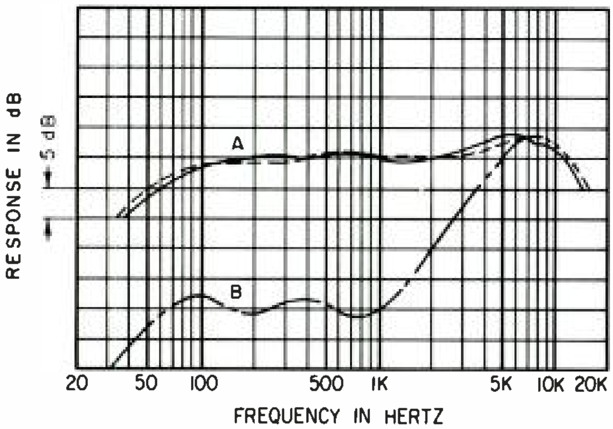
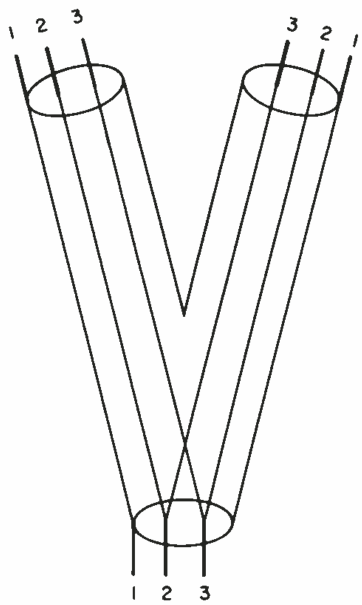


Figure 4. The out of phase connecting cable to use.



mean more to someone applying the microphone than the information on a specification sheet. These tests must occur outdoors under free field conditions similar to those of the anechoic chamber.

Under these conditions, you will be able to hear the subtle differences in frequency and polar response of quality microphones. Select a location as free of reflecting surfaces as possible. Now you will be able to hear how uniform the polar response actually is. In a studio, a microphone is subject to reflections from walls, floors, and ceilings, altering the polar response to the point where it is impossible to evaluate what the microphone is actually capable of accomplishing. The same is true of frequency response.

All rooms have audio problems that might be attributed, erroneously, to the microphone. By making tests outdoors, the walls and ceilings are eliminated. If tests are conducted on a lawn, there will be a minimum of reflection from it. If you are located where the only outside facility is a flat roof, it will serve almost as well.

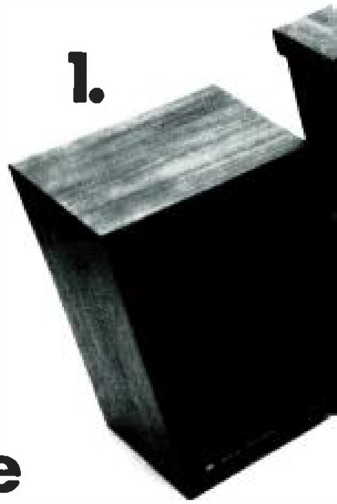
Select a day when there is little air in motion. Mount the microphone on a floor stand adjusted to bring the unit to lip height. For a check on axial frequency response, make a recording using a microphone of known response with which you have had experience. Make a half dozen recordings of a voice, repeating something like "Sally's sister sells sea shells at the seashore." Repeat this with the microphone to be tested. Then have someone mix these tapes into one, without your knowing which tape is which. This is the only way to make a fair and unbiased test. Don't kid yourself—if you know which is your pet, the test ceases to be an unbiased one. Be fair to yourself and the microphone and make your judgment solely on what you hear.

For evaluating polar response, mount both microphones, one about six inches above the other. Mark a six foot circle around the stand with pebbles or sticks or something easily followed without having continually to look down while moving. Begin by facing the microphones on axis. Instead of using a sentence, use the figure "one." Keep repeating "one . . . one . . . one" at an even level while moving sideways around the microphone until you reach 180 degrees off axis. It is important that you face the microphone continually.

Make a two-channel recording with one microphone on each track so that they may be directly compared at any angle around the microphone. This test will also help establish the angle of acceptance. As you move around the microphone, there will be a place where a noticeable change in either high frequency response or level will occur. From on-axis to this off-axis position will be the region you may use without alteration in frequency response. You may be amazed at the wide acceptance angles of many microphones.

By now one thing in these tests should be apparent; they are all made by *direct* comparison. This is the only way in which you can truly evaluate the differences between the microphone you consider to be your "standard" and a new microphone.

All tests must be by instant A-B, with no delay in switching from one to another. Tests have been made to establish how much time is allowable between comparisons and the findings are that three seconds is much too long to evaluate subtle differences in high quality sound. When the test was made with a three second delay and then repeated by instant A-B, it was found that what had been accepted with the three second delay was not accepted by the instant check. Be certain to set up all comparison tests in a way that instant comparison can be made. You will be surprised at the difference. ■



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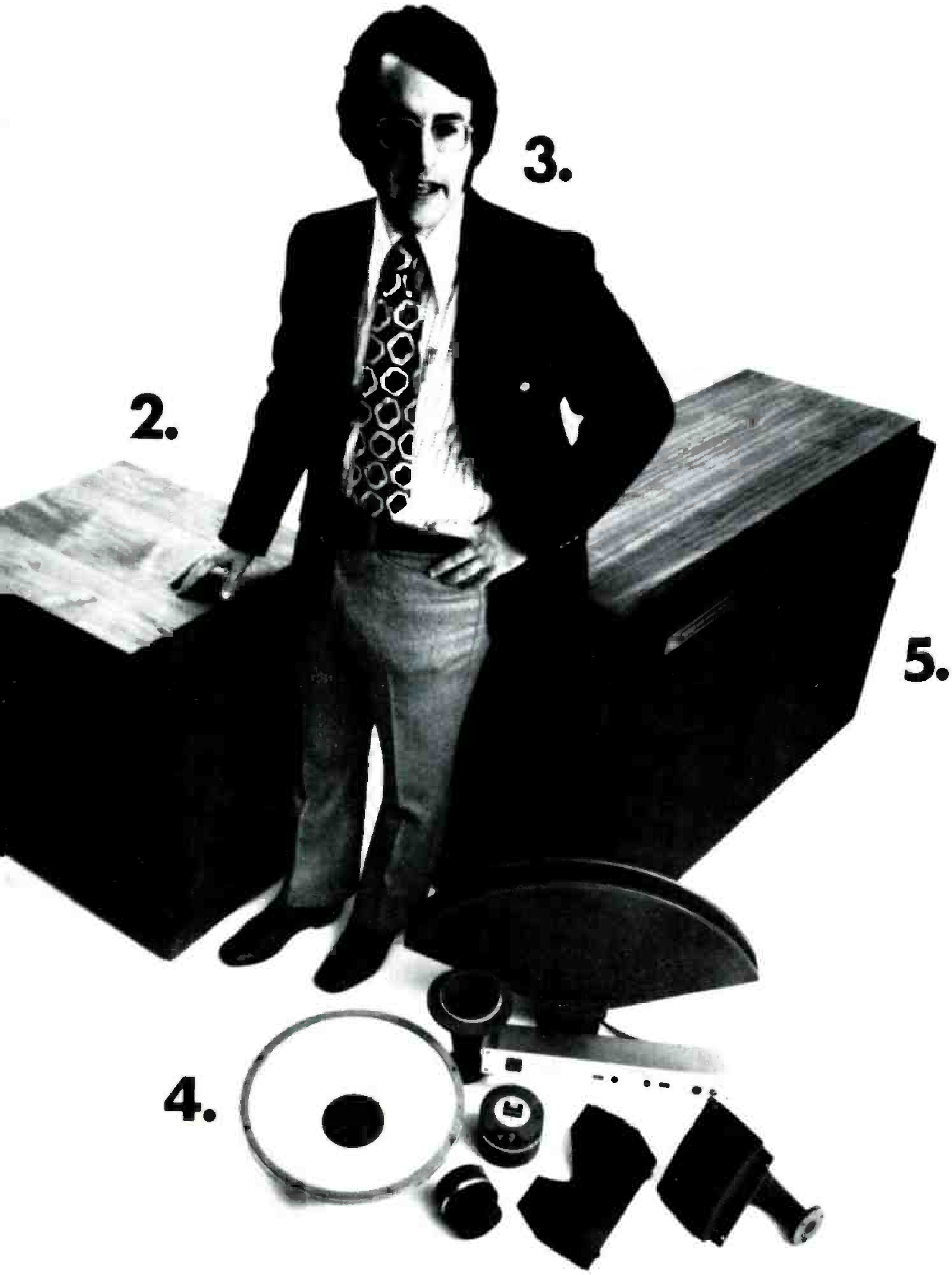

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JBL

Circle 38 on Reader Service Card

ANTHONY A. BENSON

A Simple High Quality Mic Preamp

The key here is high quality as the author describes a system that is in use to record the Philadelphia Orchestra for radio broadcasts-both at home in the Academy of Music, and on location outdoors.

INVENTION usually follows need; this was the case when the Magnetic Recorder and Reproducer Corporation was confronted with the task of providing recordings of the Philadelphia Orchestra's radio broadcasts, originating in the Philadelphia Academy of Music. A problem at the Academy of Music is that the permanent microphone installation involves many cables, each running several hundred feet adjacent to 117 volt power lines used for stage lighting. For reasons of fidelity, dynamic range, and naturalness of sound, a relatively low-output condenser microphone was chosen: the Vega Syncron S-10. It was necessary to design a preamplifier that would boost the signal at the output of the microphone to a level sufficient to overcome hum and noise induced in even a fully balanced 200-ohm line leading from microphone to mixer (located in a central control room), thereby improving the "reach" of each microphone. Listening and usage over a two-year period attest to the pre-amplified dynamic range and freedom from noise or distortion achieved. A number of these units are in continual use.

Since the requirements placed on this preamplifier are relatively severe as far as audio applications go, it may also be adapted to a variety of situations. It had to be small so that it could be mounted adjacent to the microphone without becoming an eyesore in the view of the audience. It had to be insertable in a 200-ohm line and provide gain (10 to 20 dB) without phase reversal, distortion, or reduction of signal/noise ratio. It was necessary for it to operate from the same power source as the microphone and not draw appreciably greater power (nominally 8.4 volts at less than one mA) to allow battery operation for long periods. Most stringently, it had to provide this gain with a 100 dB dynamic range (maximum signal to unweighted noise level) to be commensurate with the dynamic range available from the microphone. All these requirements were met with a simple differential amplifier circuit using balanced input and output.

TABLE 1 gives the electrical performance of the unit, based on its insertion in a 200-ohm line. The input and output transformers may be wired for other impedance levels with similar characteristics obtained. FIGURE 1 shows the schematic. The differential circuit is analogous to a push-pull circuit in that even harmonics are cancelled. The purpose of the potentiometer (R5) between the emitters of the transistors is to vary the balance of the two halves of the circuit for maximum cancellation. No capacitive bypassing of this resistor is needed; actually the slight degeneration provides added stability to the circuit. Replacing the emitter circuit with two 5-ohm fixed resistors

Anthony A. Benson is chief engineer of Magnetic Recorder and Reproducer Corp., Philadelphia, Pa.

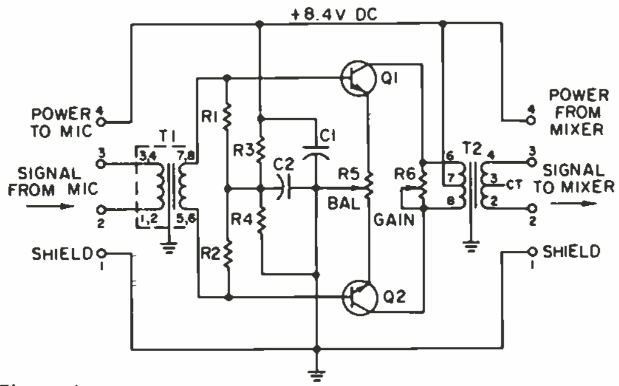


Figure 1: Preamplifier circuit, showing transformer pin connections for 200 ohms.

(Q1, Q2)—high-gain, low-noise NPN transistor (Texas Instruments 2N1302) in 3-pin socket (Elco 05-3304)

(R1, R2)—1,000 Ω ⅛ w low-noise metal film (IRC type MEA)

(R3)—110 k Ω ⅛ w.

(R4)—2,250 Ω thermistor, —2.1 per cent res. change per deg. C (carborundum type 0650F-115)

(R5)—10 Ω trimming pot, high resolution (Bourns 3280W)

(R6)—50 k Ω trimming pot, high resolution (Bourns 3282W)

(C1, C2)—mfd 15 v tantalum capacitor (Sprague TE-1157.1)

(T1)—200/800 Ω transformer and shield (UTC 0-25 and 0-17 shield)

(T2)—30k/200-2 transformer (UTC 0-10)

Note: Slip insulating material over transformer pins before installing cover. Position components so that cover mounted screws do not interfere with components or wiring. (Note particularly screws at back which are close to location of (C2).)

is less expensive but requires matching of the two transistors to obtain best overload characteristic. In random tests, it was found that usually 8 dB greater input could be accommodated at the overload, or 1 percent distortion level, by trimming this resistor to account for the differences among transistors, even those from the same lot.

The variable resistor (R6) between the collectors, is there strictly for gain adjustment. Indeed, the preamplifiers were operated for months without use of this resistor, with a gain of approximately 28 dB. Variations among transistors will manifest themselves as variations among different units. This, and the fact that less gain may be desirable, led to the inclusion of the resistor shunting the output transformer as shown. It allows gain adjustment over a wide range with no change in other characteristics.

The only critical component in the entire circuit is the thermistor, (R4). It was selected with a negative temperature coefficient, increasing the positive base bias on the transistors with decreasing ambient temperature. This compensates for the reduced gain of the transistors at low temperature, with the result that preamplifier gain is independent of temperature over the range of indoor temperatures to which the preamplifiers may be subjected. Thus, gain of a set of preamplifiers was carefully trimmed in a laboratory which, in summer, was at an uncomfortably high temperature. The next week and several hundred miles away, at an outdoor concert on a cool evening, no deviation was observed. If such temperature variations are not to be experienced, (R4) can be replaced with a fixed resistor of 2,000 to 2,500 ohms, with higher values for lower room temperatures, with no loss in performance.

Some numeric comparisons are in order. The Vega Syncron S-10 is a typical condenser microphone with a sensitivity of —53 dBm for an acoustic signal of 10 μ bar, or for an acoustic sound pressure level of 94 dB. Its inherent noise level corresponds to a sound pressure level of 27 dB, so that its electrical noise output is —120 dBm in the absence of stimulation. (Of course a sound pressure level of 27 dB is many dBs less than is observed in any auditorium with an audience present.) Compared to the —120 dBm microphone noise, the —123 dBm noise of the preamplifier (with a dummy 200-ohm input, properly shielded) contributes no additional noise. It should be

*Table 1: Characteristics of Preamplifier Without Individual Component Selection**

Power gain: adjustable 5-25 dB, non-inverting (signal polarity preserved).

Frequency response: ± dB, 30 — 20,000 Hz; ± 2 dB; 20 — 25,000 Hz.

Input impedance: 200/600 ohms, balanced.

Output impedance: 50/200/600 ohms, balanced and center tapped.

Equivalent input noise: —123 dBm; full bandwidth; unweighted.

Input overload: —23 dBm at midband; lower frequency extremes.

Power required: 8 — 16 volts d.c.; 100 μvolt or less ripple (above specifications based on 8.4 volts at 0.9 mA or 7.5 mW per section).

*Careful selection of transistors will result in improved performance, while transformer selection can be made to obtain more uniform frequency response.

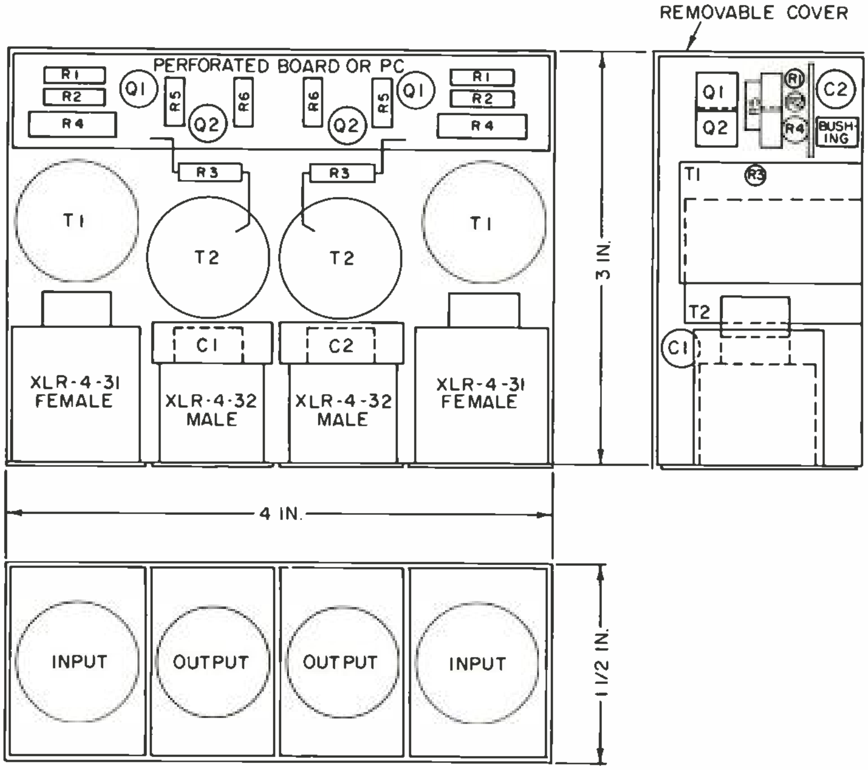


Figure 2: Parts layout for ultracompact dual preamplifier.

pointed out that this level of —123 dBm includes all hum and noise components between 20 Hz and 25 kHz, unweighted. An (A) weighted noise level will be about —129 dBm, corresponding to the best studio preamplifiers available. The noise level can be reduced with selection of the transistors; the specifications given in TABLE 1 are for randomly selected components.

The overload characteristic of the preamplifier is quite sharp. Once the emitter balancing resistor is set for the transistors chosen (so as to provide maximum drive with a given level of distortion) the point of 3 per cent harmonic distortion at midband will be found to be only 3 dB above the point of 1 per cent distortion. Taking the 1 per cent distortion level as the limiting condition, the input of —23 dBm corresponds to an acoustic signal at the microphone of 124 dB. It is found that this level is almost never reached, even for peaks of the Philadelphia Orchestra, at any position at which microphones are placed. This dynamic range between —123 dBm and —23 dBm, which corresponds to sound levels between 24 dB and 124 dB, is thus more than adequate for recording, even when several microphones' signals are added into one recording channel. The 100 dB dynamic range attributed to the preamplifiers can be extended to nearly 110 dB with selected transistors, weighted frequency response, and a 3 per cent distortion criterion. It should be noted that this discussion is of a linear circuit; there is no automatic gain control or other circuit parameter variation involved.

The Vega Syncron S-10 (for which the preamplifier was expressly designed) is a typical balanced-output microphone with the addition of a fourth lead carrying power to its internal f.e.t. amplifier. The +8.4 volt power, between the fourth lead and first (shield) is also used to provide power to the preamplifier. Obviously, a direct or phantom source of 8.4 (actually, anything between 8 and 16) volts will replace the fourth lead from the mixer and thus allow a conventional two-wire-plus-shield cable to be used. The center tapped secondary of the output transformer replaces the fourth lead in the installation's phantom-using powering. Of course, the 8.4 volts must still be fed to the microphone, which may be plugged correctly into a four-pin XLR-type input connector wired as shown in FIGURE 1.

Construction of the preamplifier is relatively easy. For the Academy of Music, the preamplifiers were to be mounted at the microphones, providing signal increase before driving a sizeable length of cable. In concert, the motorized microphones are lowered from the ceiling to within the audience's view, so the units were designed as compactly as possible. FIGURE 2 shows the layout of a dual unit with each section independent. It is mounted in a Bud CU-341 Convertabox, whose size is 1½ inches by three inches; the 1½ inch by four inch "front" faces the audience, and short four-wire cables connect each unit to a pair of microphones which are directed at the stage.

In order to provide flexibility, four-pin XLR-type input and output connectors were incorporated, mating with the connectors on the microphones. (A wired-in arrangement could dispense with the connectors, and each section could be contained in a space 1½ inches by 2 inches by 2 inches.) The Convertabox has a removable cover which is right-angled and serves as the "top" and "back" of the unit. Because it is so compact, assembly is a bit difficult; the connectors should be installed with their leads already soldered, before the transformers are installed and wired. The perforated board or printed circuit should be installed last. Note that there are no leads between the input/output connectors and this board (except for ground). Signal leads connect to the transformers, and the +8.4 volt lead goes only to the output transformer and two small components, (C1) and (R3), which are mounted external to the board.

FIGURE 2 indicates that (C2) is mounted below the perforated board with the other components above it. The board may be mounted to the Convertabox with two or three bushings or spacers; H. H. Smith 8769 threaded spacers 7/16 inch long are convenient. Screws ¼ inch long secure the board to the spacers, and similar screws secure the spacers to the "bottom" of the Convertabox, which may be grounded to a shield lead via a terminal lug under one mounting screw.

Because the circuit is relatively of low impedance and maintains a fully balanced state, there are no requirements on lead dress or component placement. Sockets are recommended for the transistors, to enable matching or replacement without soldering. Although not necessary in many situations, a steel container Convertabox was used for the units which are immersed in the high capacitive and inductive fields of a modern hall with much sound, lighting, and air conditioning equipment in operation.

If more than one channel of preamplification is built into a single container, only one shield lead should be used for grounding the container to the rest of the equipment. Hum has been found to be induced through a ground loop when the shields of two channels (originating at a central location) were both tied to the preamplifier chassis at a remote location.

The units have been found relatively insensitive to mechanical shock and vibration. The transistors are held in place with foam or sponge, and all small components are secured by their leads. The resulting design is not microphonic. even when hand-held, although tapping hard on the case can be heard in the absence of any other signal. The units may be operated in any position; they are far less susceptible to power supply hum and noise than are the microphones for which they were specifically designed.

Signals due to power supply ripple of 100 μv was not observed in the preamplifier output when fed from a dummy 200-ohm source, but ripple in the order of 10 μv or lower is required to obtain the full dynamic range from the condenser microphones.

Since the preamplifier draws less than one mA and the microphone draws about half of that, battery operation is feasible. A single TR-126 type 8.4 v mercury cell will power one channel on mic and preamp for over 300 hours, if the mercury cell achieves its 500-600 mA-hr rating. Since the installation at the Philadelphia Academy of Music is permanent, however, a well-filtered a.c. supply provides central powering for several channels of mic and preamp, by the use of four-wire cables (shield, two signal, and power). There is no measurable change in performance in the preamplifier when driving 250 feet of standard microphone cable. The unit was designed to serve as a preamplifier capable of overcoming cable hum and noise and allowing low-sensitivity microphone mixer circuits to be used. Hence, it was not designed to provide line outputs. On the other hand, if the output transformer is wired for 600 ohms, the output signal (which at full gain will exceed 0 dBm before distortion occurs) is sufficient to drive many mixers and amplifiers that have relatively sensitive line inputs.

Thus the unit may find application between a microphone which is more sensitive than the Vega Syncron S-10 —providing greater input signal to the preamp—and a mixer or amplifier whose input need not be at full line level to drive it adequately. In such an application, removal of the gain adjustment resistor (R6) entirely allows the unit to provide power gain of about 600x, or approximately 28 dB, with an equivalent input noise level of −123 dBm (corresponding to 0.3 μ volt when driven by a dummy 200-ohm resistor. Increase of the d.c. supply voltage to 16 volts adds a few more dB. Further amplification of the unit's output is easily performed thereafter. ■

DOUGLAS C. EASTON

Lick the Clutter Syndrome

There is nothing quite like the jungle appearance of microphone stands in a studio prepared to record a large rock group. Here are some ways to create a more manageable situation.

MICROPHONE stands and booms are basic in both studio recording and public address. Often, however, the large number of stands necessary for many modern miking arrangements results in the all-too-common mike stand clutter and confusion syndrome. Fortunately, with "creative microphone standing," it is possible to lick the clutter syndrome and, at the same time, at least double the mechanical, esthetic, and acoustic versatility of microphone stands.

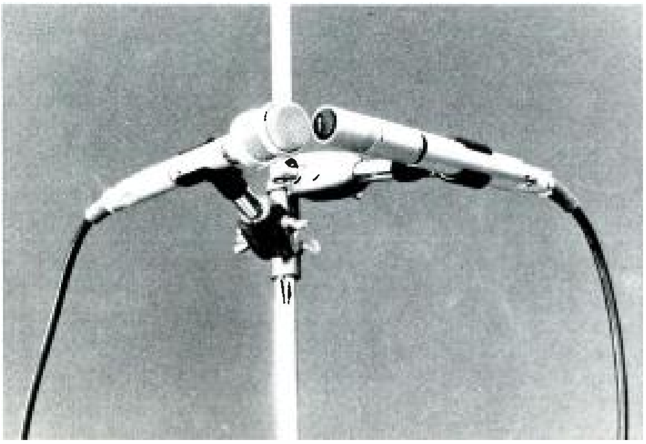
At the heart of creative microphone standing are three stock components. First, you'll need a short threaded extension tube such as the Atlas part #AD-7. This is a three inch long, ⅝ inch diameter tube male, threaded at each end to accept the microphone clamp that comes with any dynamic microphone. The price of this extension tube is about 84 cents.

Second, you'll need the little screw-on retaining ring that comes on the threaded end of any stand or boom.

Third, remove the boom from your stand-with-baby boom and for now, put it aside. The part you're interested in is the boom adapter.

Now, slide the boom adapter onto the verticle extendor of your favorite microphone stand. You'll find that the slider is the same diameter as your discarded boom, and that you can lock the boom adapter securely onto the slider at any point you wish. Next, insert the three inch extension tube, plus ring, into the boom adapter and tighten

Figure 1. The one-stand coincident configuration.



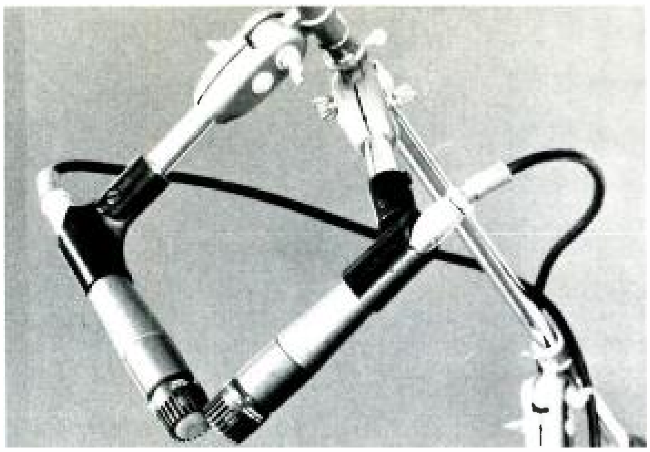


Figure 2. A coincident configuration mounted on a boom.

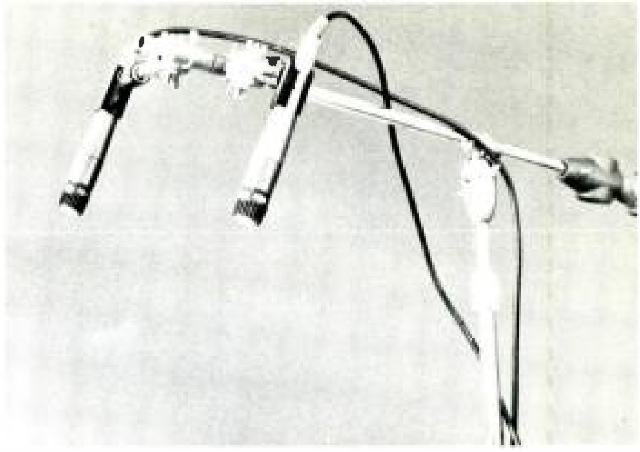


Figure 3. The same as Figure 2, but with different mic positioning.

it up just as if you were attaching a boom.

Do the same with a second boom adapter and three inch tube, and put the second assembly on the same vertical slider of the same microphone stand. Attach a microphone to each tube, and you're on the way to an extremely versatile, rigid, movable-as-a-unit method of using two microphones without two times the clutter.

Just in case your initial reaction is "so what," think about the last time you had to stereo-mic an instrument, or orchestra with, for example, a coincident microphone arrangement. The coincident configuration uses two similar microphones head-to-head at approximately a 90 degree angle. This method produces a very natural stereo image with minimal phase cancellation in mono. If you have ever tried using two microphones head-to-head with *two* separate stands and booms, you know that a housefly landing on one of the stands is enough to knock them mechanically out of their delicate balance. And, with musicians stumbling about a studio, it is only a question of time before the delicate two-stand arrangement is disturbed.

But with the "creative" one-stand coincident configuration shown in FIGURE 1, Murphy's law becomes a thing of the past. Not only are the two microphones so rigidly locked together head-to-head that bumping the stand won't bother the delicate 90 degree angle, but it is possible to move the stand and mikes across the room with cables attached, the mikes remaining in absolutely perfect alignment.

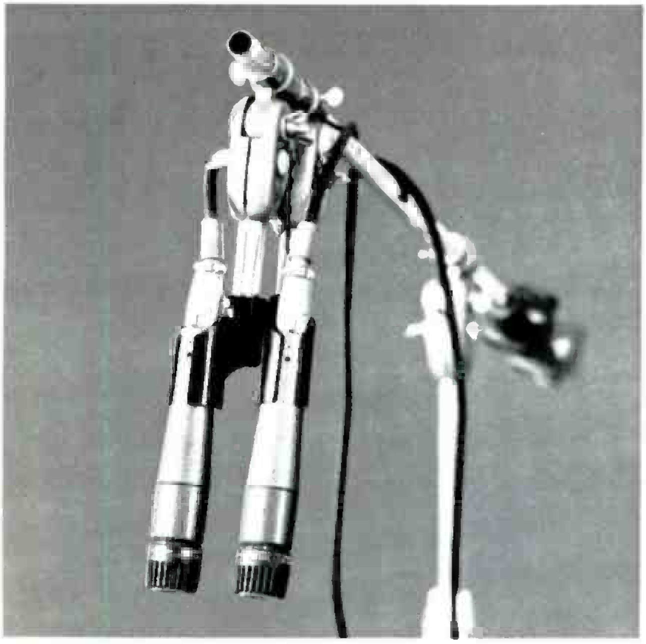


Figure 4. This configuration has a variety of uses.

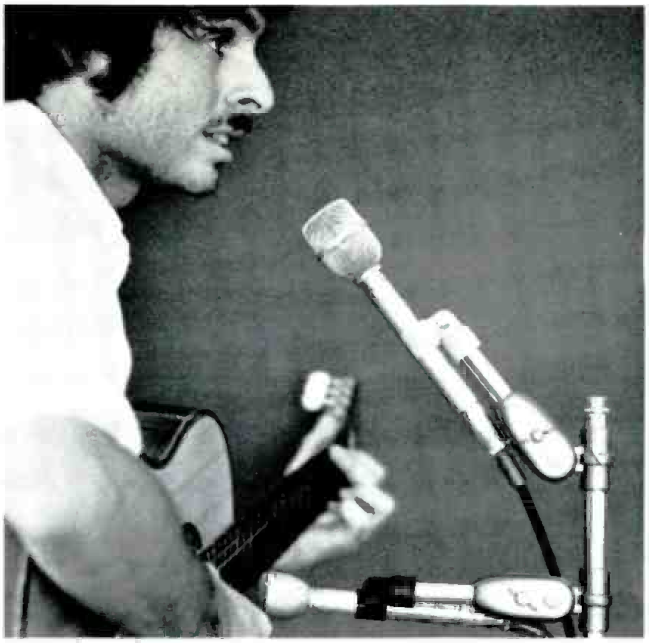


Figure 6. This problem solver uses stock components.

Here are some suggested applications for the basic coincident-on-a-stand configuration: overall orchestra pickup with good stereo localization plus mono compatibility; symphony orchestra pickup with coincident mikes mounted on the ceiling out of the way of the performance; permanent ceiling-plus-extended mounting for overhead coincident drum pickup in a standard studio location.

FIGURE 2 shows a coincident configuration mounted on a boom. This setup is a natural for overhead drum pickup which avoids phase cancellation in mono as well; piano pickup (mono compatibility plus a believable stereo image —not a twenty foot wide piano effect); bongo drums; vibes; and any application requiring a very natural stereo image, plus mono compatibility.

FIGURE 3 is the same setup as FIGURE 2, except that the microphones are pointing downward and are parallel but about a foot apart. This configuration is excellent for percussion such as finger cymbals, tambourines, bells, sand-blocks, chains, etc. The musician can even "pan" the stereo image himself by moving his instrument side to side on alternate beats. On drums, try accent miking double shell toms about six inches up, one microphone to each, with the boom coming in midway between the double shell toms. A unique and sometimes desirable ping-pong effect will occur on the toms. The rest of the drums are miked conventionally, such as coincident overhead. Still other applications, such as stereo piano (producing a wider stereo image than the coincident technique, useful with dull sounding pianos) and conga drums, are possible with FIGURE 3's configuration.

Figure 5. An effective means of miking an acoustic guitar.

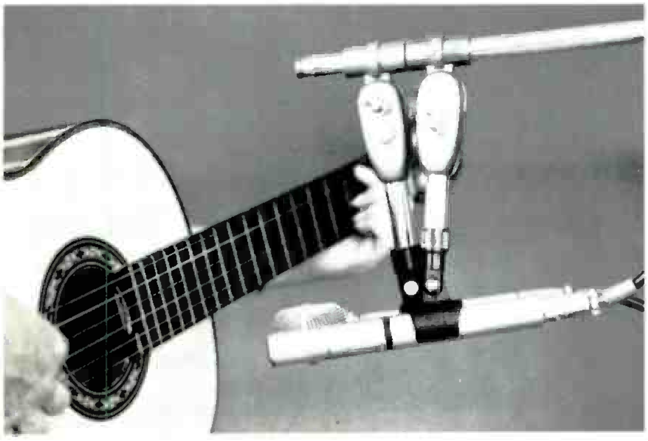
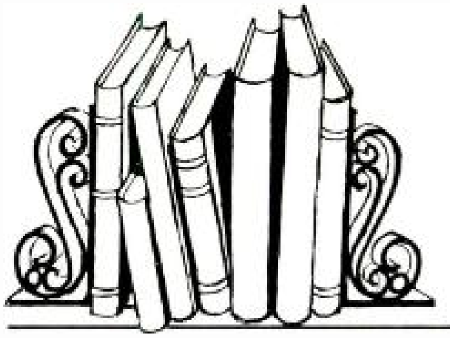


FIGURE 4 is useful for A-B ing two similar or different mikes, for producing a center channel for mixers that are left and right only, for creating a pseudo-stereo pickup from a mono source, such as an electric guitar speaker by eq'ing the microphones differently on each channel. In the interesting double-shell-tom idea mentioned in the previous paragraph, FIGURE 4's configuration should be used when employing microphones such as Neumann KM-86's which pick up from the sides.

FIGURE 5 shows a unique method of stereo miking an acoustic guitar which produces the most realistic, alive sound the author has ever heard. Since the sound arrives at the cartridges of both microphones simultaneously, there is no phase cancellation at all in mono. Yet in stereo, the slightly different response characteristics of two high quality but different microphones produces a sound so excellent, it has to be heard to be believed.

FIGURE 6 solves a problem, using stock components, that public address men have heretofore solved only with specially made clamps and contraptions. Pickup of vocals, plus acoustic guitar simultaneously becomes painlessly simple. A super-cardioid microphone is used for the vocals. Since a super-cardioid produces maximum rejection at 150 degrees off axis, rather than 180 degrees, it can be seen from the photograph that there is an amazing amount of isolation in the vocal channel from the guitar microphone. This can be quite an advantage if it is desired to add compression or eq on the vocal channel without being affected by leakage from the guitar, for example.

FIGURE 6's configuration is useful also for a vocalist plus tambourine, vocal plus banjo, and, of all things, saxophones! Some jazz saxophonists intermingle mouth sounds, burps, and yells with their saxophonic cacophony, and would sincerely appreciate the super-cardioid for these utterances, as well as an omnidirectional microphone for the sax itself. ■



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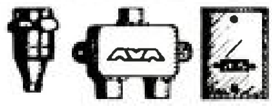

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MCI JH-416Q-LM 24 in/24 out; 24-light module console, $20,000. MCI JH-416 20-in/20-out console, $15,000. MCI JH-16; 16-track recorder with auto locator $12,000. Fairchild FPC-34 12-in/4-out console, $3,000. Gately EM7-S 4-in/2-out console, $580. **Contact Tom Jung, Sound 80, Minneapolis. (612) 721-6341.**

HARPSICHORD 8 FEET "SABATHIL" BACH I" two keyboards; 5 pedals; four sets of strings; teak finish; excellent condition. Sells new over $5,000, selling price, $2,750. Can be seen any day except Sunday. **O-D-O Sound Studios, 254 W. 54th St., New York, N.Y. Please call for appointment, (212) 757-3180.**

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EXPERIENCED in professional lighting/sound control; package design; construction; solid technical background; BSEE with credits toward MSEE. Seeking design position in Southern California. For resume, reply to **Box PM, 1125A Loma St., Long Beach, California 90803.**

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PROFESSIONAL RECORDING PERSONNEL SPECIALISTS. **A service for employers and job seekers. Call today! Smith's Personnel Service, 1457 Broadway, N.Y.C. 10036. Alayne Spertell 212 Wi 7-3806.**

MULTI-MEDIA ENGINEERING SUPERVISOR needed for large midwestern electronics contractor; knowledge of sound, CCTV, audio-visual projection equipment essential. Will be responsible for supervising installations of complex audiovisual systems requiring close liaison with and training of owner's personnel. E.E. or P.E. helpful. Good pay and generous profit sharing program. Send complete resume with salary history to **Box 53, db Magazine, 980 Old Country Rd., Plainview, N.Y. 11803.**

PEOPLE, PLACES, HAPPENINGS

• An extensive complex, consolidating executive and divisional offices as well as other of its Metropolitan area facilities is planned by **Matsushita Electric Corporation of America,** producers of Panasonic electrical products. The new multi-million dollar center will be part of the 720-acre Free Zone Center being developed by **Hartz Mountain Industries** off Route 3, in Secaucus, New Jersey. Completion of the move to the 50-acre landscaped site overlooking the Hackensack River is slated for January, 1975.

• Noise control, according to a study by market research firm **Frost & Sullivan,** will provide 1.8 billion dollar market by 1980 for those working in this field. Demands will include a myriad of possibilities, such as consultation and measurement analysis, the manufacture of noise deadening materials and the re-designing of everything from garbage cans to housing developments with an eye to lowering ear-polluting decibels.

• **John Hollands,** vice president and general manager of **BSR (USA) Ltd.,** the American marketing organization of BSR Ltd., of Birmingham, England, has announced the appointment of **Jerry Roth** as eastern regional sales manager for BSR's consumer products division. Before joining BSR, Mr. Roth was eastern regional sales manager for **Yamaha** hi-fi products and had earlier been national sales manager for **Telefunken (USA).**

• **Dean A. Bussart** has been named general manager of **Gulton Industries, Ltd.,** the Canadian electro-acoustic group, and of its subsidary, **EV of Canada, Ltd.** Mr. Bussart will be in charge of all Gulton/Electro-Voice operations at the company's Gananoque, Ontario facility and will also have direct responsibility for the Canadian marketing of E-V products. Bussart most recently was with **Motorola of Canada,** and formerly, **Union Oil Company.** He holds a Bachelor of Science degree from the **University of Illinois** and an MBA from the **University of Michigan.**

• Expansion of its San Diego, California facilites has been announced by **Sony Corporation of America,** with the commencement of the construction of a new plant adjoining the Sony building in Bernardo Industrial Park. The new facility, whch is expected to be in operation early next year, will house the production of Trinitron color television picture tubes used in Sony color television sets assembled in the company's existing San Diego plant.

• The appointment of **Robert G. Schlenzig** as plant manager of its Colorado Springs, Colorado operations, manufacturing closed-circuit television and broadcast products and professional audio tape recorders, has been announced by **Ampex Corporation** of Redwood City, California. Schlenzig joins Ampex from **Northrop Electronics,** Norwood, Mass., where he was director of operations. Prior to that he was with the AC Electronics Division of **General Motors Corporation.**

• **Rein Narma,** group vice president of **General Instrument Corporation's** semi-conductor products group, of Hicksville, N.Y., has been promoted to the new position of group vice president, Far East, and president of General Instrument of Taiwan, Ltd. The firm has four manufacturing facilities on Taiwan, with general offices in Taipei. Mr. Narma will also oversee the purchasing office in Tokyo. Prior to his association with General Instrument, Mr. Narma was vice president and general manager of the consumer and educational products group at the **Ampex Corporation.**

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You pay for what you need

If you're seriously into music or sound reinforcement you want more than hi-fi products can give you. But full professional studio gear costs an arm and a leg, and you pay for a lot of things you may not really need.

That's why there's a TASCAM Model 10. It's an 8-in, 4-out mixing console, and it's just $1890.

With the Model 10 you get what you have to have. Without sacrificing a single necessary function.

Each input module gives you mic and line attenuation, three bands of peak and dip equalization (two with frequency selection), pre- and post-echo send and receive circuitry, pan function, and a unique straight-line fader.

Each of the four submasters has a meter control switch (line/echo), independent monitor level control, echo receive level control, and a straight-line fader. You also get a master gain module and 4″ VU meters with LED peak indicators. Plus pre-wired facilities for up to four additional input modules and other optional accessories including talkback, remote transport control, quad panner, and headphone monitor.

That's what you need and that's what you pay for. Some things, however, you may or may not need, and we leave that choice up to you. For instance, the basic Model 10 is high impedance in and out, but studio line impedances are available optionally. You'll probably want low impedance mic inputs, but you may not need all low impedance line inputs. So we don't make you pay for them. You can order any combination of high and low input/output impedances according to your application.

Details and specs on the Model 10 are available for the asking. At the same time we'll tell you about our new Series 70 Recorder/reproducers.

We've got what you need.

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It's easy to spot the new Musicaster IA. Look! Listen!

EV All that's left of the great old Musicaster* is the size and the mounting hardware. Everything else is changed—and it's all for the best.

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The enclosure is new, too. By using a one-piece glass-filled polyester housing, we saved two pounds overall, without reducing strength or utility. The peripheral ducted port combines with a fiberglass-filled interior to smooth and extend bass response.

And don't overlook the importance of good looks. The clean, contemporary lines of the new Musicaster will get you quick architectural approval where less handsome speakers would be banned out of sight.

The net effect is a great music speaker that also does full justice to voice. The ideal combination for so many of your multi-purpose sound installations. And the mounting bracket still doubles as a handle for portable use.

Finally, you can choose from two models, the basic Musicaster IA at $80.25†, or the Musicaster IIA with horn-loaded T35B tweeter for extended highs and outstanding uniform polar response at only $101.10†. Both cost a little less than the old Musicaster; but they give you much more to sell. Prove it to yourself today.

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