

DEC/JAN 1976

VOL. 1 NO. 2

\$1.50

MODERN RECORDING

SERVING TODAY'S MUSIC/RECORDING-CONSCIOUS SOCIETY



A Session with
Stevie Wonder

Build Your Own
Recording Studio
for Under \$500

History of
Recording, Part 2

Lab Reports

New Products

Record Reviews



At TEAC, our fundamental mandate for any new product is performance and reliability. First and finally. Qualities that are measurable in terms of mechanical stability and inherent design integrity.

These are essentials. Because our technological resources established the cassette deck as a true high fidelity component. So we demand that a new product possess that measure of TEAC quality.

And that's what distinguishes the A-170. Compare it with other inexpensive cassette decks with Dolby, please. Just call (800) 447-4700* for the name of your nearest TEAC retailer. We think you'll agree it's a value you can rely on.

*In Illinois, call (800) 322-4400.

A-170

TEAC performance and reliability...

how can you really afford anything less?

TEAC.

The leader. Always has been.

Dolby is a trademark of Dolby Laboratories, Inc.

TEAC Corporation of America / 7733 Telegraph Road, Montebello, Ca. 90640 ©TEAC 1975

THE VOCAL PROJECTOR

A reasonable alternative to the "Black Box Blues"

After extensive research into the soundman's "response vs. portability" dilemma we've arrived at what we feel is the ideal solution...The Peavey Vocal Projector. The Vocal Projector system is a compact, highly portable system that maintains the wide frequency response of the bulky theater type "Black Box" enclosures.

These new enclosures are bi-amp compatible and employ matched low, mid, and high frequency components in a three-way system that is crossed over by a precision inductor/capacitor type crossover network.

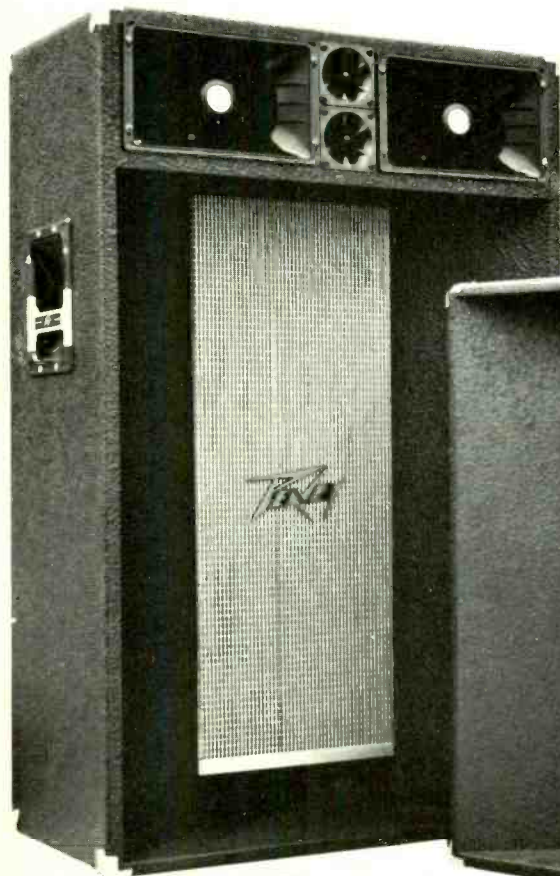
Lows are handled by a super heavy-duty 15" driver employing a 3½ pound magnet coupled to a 2" aluminum voice coil assembly.

Low frequency is enhanced even more by the Vocal Projector's ported, horn loaded enclosure.

The mid range of these systems is provided by a high quality folded horn. This horn is coupled to a motor/driver assembly with a 1½" voice coil wound on an extremely heat resistant phenolic coil form.

The extreme high frequencies are reproduced by the popular Piezo super tweeters, and add response to 20 KHz.

High quality, selected components in a well designed system make the Peavey Vocal Projector unmatched in value...a truly outstanding alternative to the "Black Box"



215HT

*Two 15" drivers, two mid horns, two Piezo tweeters in a 4 ohm enclosure. \$425. list price.



PEAVEY ELECTRONICS, MERIDIAN, MS . 39301



115HT

*One 15" driver, one mid horn, two Piezo tweeters in a 8 ohm enclosure. \$275. list price.

CIRCLE 34 ON READER SERVICE CARD



If you truly appreciate sophistication in sound reproduction, you should know about Accuphase. Uncompromising audio electronics for those who have the ear for it.

To that end, TEAC Corporation of America has reserved a free copy of a very informative booklet for you. In it, you'll find a comprehensive collection of test reports on Accuphase equipment. In-depth, unabridged investigations and conclusions by the nation's most respected experts and testing laboratories. Reports that will likely surprise even the most knowledgeable audio enthusiast.

To claim your free copy, simply send us this completed reservation. If you have the ear for it, we think you'll agree that the critical acclaim is as impressive as the product itself.

Accuphase

Your name _____

Your address _____

TEAC Corporation of America 7733 Telegraph Road, Montebello, CA 90640

MODERN RECORDING

SERVING TODAY'S MUSIC/RECORDING-CONSCIOUS SOCIETY

DEC/JAN 1976

VOL. 1 NO. 2

THE FEATURES

THE HISTORY OF RECORDING,

18

By Robert Angus

The incredible story of how financier Charles Dexter Rood—the Yankee farmboy who built a business empire and wound up being charged for treason—managed to obstruct the development of tape recording for nearly thirty years.

BUILDING YOUR OWN

RECORDING STUDIO [for under \$500]

28

By Jeff Cooper

Are you interested in building a recording studio, but hesitate due to the difficulty of such a major project? You will be surprised, then, at how clear and practical Mr. Cooper's explanation is—and how little it all can cost.

A SESSION WITH STEVIE WONDER

36

By Gene Charles and Bob Weil

An in-depth report on one of the "hottest" and most inspired artists in the rock sphere. MR's writers covered the Wonder entourage for a month, in sessions frequently lasting from midnight through sun-up, and have captured "Stevie Wonder, musician" in all his unpredictability, talent and warmth.

COMING NEXT ISSUE!

*A Session with The Beach Boys
The Men Behind the "Wall of Sound"—
Phil Spector and Larry Levine
History of Recording, Part 3*

Cover design by Frank Santelia

Cover photo by Matthew Cupp

Modern Recording is published bi-monthly by Recording Institute Publishing, Inc., 15 Columbus Circle, New York, N.Y. 10023. Design and contents are copyright 1975 by Recording Institute Publishing, Inc. and must not be reproduced in any manner except by permission of the publisher. Subscription rates: \$7.50 for one year; \$13.50 for two years; \$18.00 for three years. Add \$1.50 per year for subscriptions outside of U.S.; subscriptions must be paid in U.S. currency.

THE STAPLES

READER'S FORUM

4

Does the audio industry ignore women?

TALKBACK

6

The technical Q & A scene.

THE PRODUCT SCENE

14

By Norman Eisenberg

The notable and the new, with a comment on "loudspeaker" cable.

AMBIENT SOUND

46

By Len Feldman

Dolby FM is a reality at last. So what does that mean for noise and old equipment?

PROFILE

48

By Gil Podolinsky

Bob James, Grover Washington and George Benson discuss how CTI records are made in interviews held before James and Benson left the label.

LAB REPORT

52

*By Norman Eisenberg
and Len Feldman*

Beovox M70 "Phase Link" Speaker System
Sound Workshop Model 882M

Recording/P.A. Mixing Console

Luxman C-1000 Stereo Preamplifier

Yamaha TC-800GL Cassette Recorder

GROOVE VIEWS

62

Reviews of new albums by Bruce Springsteen, Dizzy Gillespie, Bernard Herrmann and DG's new classical cassette line.

MUSICROSS

72

By Don Casale

LETTERS TO THE EDITOR

72



SEDGWICK CLARK
Editor

H. G. LA TORRE
Associate Editor (East Coast)

BOB WEIL
Associate Editor (West Coast)

**ROBERT ANGUS
NORMAN EISENBERG
LEONARD FELDMAN**
Audio Editorial Board

FRANK SANTELIA
Art Director

STEFFON A. KACHOCKI
Production Coordinator

ELLEN M. GASSTER
Executive Secretary

JERRY LEVINE
Circulation Director

RICHARD FERTELL
Assistant Publisher and
Advertising Director

VINCENT P. TESTA
Publisher

Editorial and Executive Offices
Recording Institute Publishing, Inc.
15 Columbus Circle
New York, N.Y. 10023
(212) 582-3680

West Coast Offices
6565 Sunset Blvd.
Los Angeles, Cal. 90028
(213) 469-6333

Editorial contributions should be addressed to
The Editor, Modern Recording, 15 Columbus
Circle, New York, N.Y. 10023. Unsolicited manu-
scripts will be treated with care and must be
accompanied by return postage.



I am not a feminist and am most often repelled by feminists' generalizations and activism. I have no sympathy for people who create and rely on group fervor and fads instead of realizing that they are individuals with personal concerns (which may or may not be common). Most often, I ignore the fact that females are ignored, hoping that individuals of intelligence, regardless of sex, will not be.

The audio industry, however, for all its recent growth and financial success, is overlooking half of its potential consumer market.

In fact, I had not realized the exclusion of females from audio until recently. Because interest in a field incites one to read about and explore it, information is absorbed without regard for its implied audience. Women are used to reading popular journals geared toward men; we ignore references to the sex of the intended consumer (often deploring the content of articles or magazines meant for us anyway). Recently, however, I realized that not only have I seen nothing in audio directed toward women, but also that at least 90% of all material I've seen published on the subject has been geared specifically toward men.

Only rarely have I read an article in an audio periodical in which the reader is not obviously assumed to be male. In particular, the "How-to" articles are guilty of this bias—all demonstrators of the technique discussed are men (in explanatory photographs); people cited in the articles as having successfully mastered or developed the techniques are always male. Entire staffs of audio magazines are men; all the writers and reviewers (of whom a great number of females exist) are male. The near-total exclusion of women from this field is staggering.

Interest in audio could be considered basically interest in music, science, or (hopefully) their combination. Adeptness at either of these has nothing to do with the sex of the individual—there are many women involved in these fields professionally, and all literature and other communications in both are no less oriented to females than to their male associates. Why, then, should a field in which art and science are combined ignore women? Perhaps men, when presented with this problem, would even be unaware that it exists; perusal of a small library of audio journals can show it clearly. Even the advertising is directed toward men—some of the more blatant examples would offend almost anyone (a recent ad for a speaker system with a nude female quadruplicate is a perfect example). Every time I see "hands-on" advertisements for equipment owned either by myself or by women I know, a man is pictured using it. Is the audio industry consciously ignoring a huge part of its potential market?

Grace E. Patti
New York, N.Y.

The end of the war between art and engineering.



*Console shown is optional.

There is performing and there is engineering. Art and signal. Both are important and both can suffer when you have to do both. Especially when your music and the machine that records it are making heavy demands on your concentration.

Our new 1140 lets you focus more on your music and worry less about how it's getting there.

Take sync. The 1140's simplified automatic sync control is a more logical approach to the function than anything you've used before. It frees you from that "Where the hell am I" frustration when you're building tracks.

It also lets you punch in (and when you punch in you're automatically switched from sync to source).

Sync level is the same as playback level, too, in case you don't have a third arm available for gain control.

The 1140 has built-in bias with the bias controls up front so you don't have to tear the electronics apart every time you change tapes. Plus a 200 kHz bias frequency for further noise reduction and one of the few heads around capable of erasing those exotic new formulations.

Then there's program memory, motion-sensing circuitry for anti-

spill tape handling, peak level indicators and an optional floor-standing console that makes the 1140 even easier to work with.

For all that and more the 1140 costs \$1199.95, about 45¢ more than Teac's A3340S. But if you spend that extra half-a-buck with us, you can spend more time with your music.

DOKORDER



	TEAC A3340S	DOKORDER 1140
Wow and Flutter 15 ips	0.04%	0.04%
Frequency Response at 15 ips	±3 dB, 35-22K	±3 dB, 30-23K
Signal-to-Noise Ratio	65 dB WTD	60 dB WTB
Front Panel Bias Controls	No	Yes
Built-in Test Generator	No	Yes
Mic/Line Mixing	Yes	No
Peak Indicator Lamps	No	Yes
Motion Sensor	No	Yes
Manufacturer's suggested retail price	\$1199.50	\$1199.95

Features and specifications as published by respective manufacturers in currently available literature.

5430 Rosecrans Avenue Lawndale, California 90260

CIRCLE 24 ON READER SERVICE CARD

TALK BACK

"Talkback" questions are answered by professional engineers, many of whose names you have probably seen listed on the credits of major pop albums. Their techniques are their own and might very well differ from another's. Thus, an answer in "Talkback" is certainly not necessarily the last word.

We welcome all questions on the subject of recording, although the large volume of questions received precludes our being able to answer them all. If you feel that we are skirting any issues, fire a letter off to the editor right away. "Talkback" is the Modern Recording reader's technical forum.

The "Jet Plane" Effect

The following questions came to my mind while attending a recent RIA recording class presented in Cleveland. I am looking forward to your new publication and am certain the information you will be circulating shall be very helpful to newcomers such as myself.

(1) What is the technical reason why a signal cannot be transferred to an adjacent track (on a multi-track machine) while operating in "sync"?

(2) How does a phase-shifter alter a normal signal to produce the "jet plane" effect?

(3) How many musical instruments (such as the piano) can be effectively recorded in stereo?

—George N. Vondrasek,
Cleveland, Ohio

(1) Assuming that the quality of the playback signal (frequency response) is sufficiently good, we can address ourselves to the main problem. If we try to transfer a signal in the above manner, we will have a problem of feedback caused by the magnetic field

produced by the record head. If, for example, we are playing back track 6 in sync and trying to transfer the information contained on it, along with another program source, to either track 5 or track 7, the magnetic field generated by the record head is picked up by the adjacent playback head.

Since the primary job of the playback head is to detect a changing flux, our problem is increased further. As a result, we begin the "round robin" feedback as the field generated by the record head is picked up by the playback head, fed back through the record head, etc. Although shielding on present-day head stacks is pretty good, it is usually not good enough to prevent the problem because of manufacturing parameters. If it is absolutely necessary to carry out this procedure, and you are willing to sacrifice some signal-to-noise, try recording at a lower level and you might get by.

(2) It is usually accomplished by splitting the incoming signal into two paths. One goes through the device with no change, while the other is subjected to a very short variable time delay. The two signals are combined again prior to the output of the device. Because of the time difference between the two signals arriving at the output, various frequencies are electrically in and out of phase with each other in the combined signal. This causes varying degrees of reinforcement and cancellation of frequencies through the audio spectrum. The result is the familiar "comb filter" or "jet plane" effect.

(3) First, the question seems a little vague, since we should define the total process of record-reproduce (stereo-binaural) more accurately. However, guessing at the intended meaning of the question, I offer the following: any sound generator which has a real-

istic right-left perspective, can be recorded and reproduced in a similar fashion. A clarinet, for instance, would not fit my definition very well, and could not be effectively recorded-reproduced in this manner in terms of preserving a natural sound. However, pianos, horn sections, strings, percussion sections, etc., all produce very good perspectives in the stereo curtain.

—Skip Frazee,
Sound Techniques,
Dallas, Texas

Miking an Electric Bass

How do you mic an electric bass?

—Howard Meyer, New York, N.Y.

An electric bass may be recorded either directly into the console or with a microphone on the amplifier. Recording the bass directly results in a clear, smooth sound. It also eliminates the possibility of leakage from other instruments getting onto the bass track.

Miking the amp, however, usually gives a richer sound due to the natural harmonic distortion of the speakers. Other desirable sound qualities may also be obtained by overdriving the amp and/or varying the controls. Getting a good bass sound with this technique is usually related more to the intrinsic qualities of the speaker box and amplifier rather than the type of microphone used.

Both techniques may be combined, however, to maximize the qualities of both the direct and the amplified signal. When combining these two signals, one must be careful that the direct signal and the mic signal are in phase. Otherwise, the low frequencies will cancel each other.

I prefer to work with any good car-

dioid, dynamic microphones such as the EV RE20, EV RE16 or the Shure SM53. The microphone would be placed twelve inches or less from the speaker cabinet, facing directly into the cone.

—Quentin Meek,
Studio Six,
Montreal, Que.

Drum Recording Tips

(1) What's the best way to record a full drum set, as far as position goes? Also, what is the best complement of mics to use?

(2) Once recorded, on what tracks should the drums and percussion be placed to get the best mix?

(3) On vocals, should harmony parts have as much presence as lead parts? What tracks?

J.T. Craig Jr.
Wheeling, W. Va.

(1) If your question refers to where the drums should be placed in a given room (most every engineer I know has a slightly different way of approaching this question), I personally feel that this depends on the type of music to be recorded.

Generally, the drums should be placed in the most acoustically dead area of the room and well gobo'ed. In certain situations, such as a jazz session or even hard-rock, I have placed the drums in the livelier areas of a studio for more "open" sound.

If your question refers to the position of the drums relative to the other instruments in a room, I always try to place the rest of the rhythm section in close proximity to the drummer, with good visual contact as well. Depending upon the musicianship, of course, this will always provide a tight rhythm sound.

Regarding the rest of the instruments in a given session, such as brass, woodwinds and strings, if it's a "live" session with all elements present for the initial recording as opposed to sel-syncing, these sections should be placed in the given order away from the rhythm section with the bass and drum as the hub. Depending upon the room size and acoustics, it might be necessary to give the musicians headsets to overcome any sound lag in the room itself.

Choice of microphones is really a

matter of personal preference. I might say that all engineers, drummers and producers do not hear exactly the same. The type or style of music being performed might also dictate microphone selection.

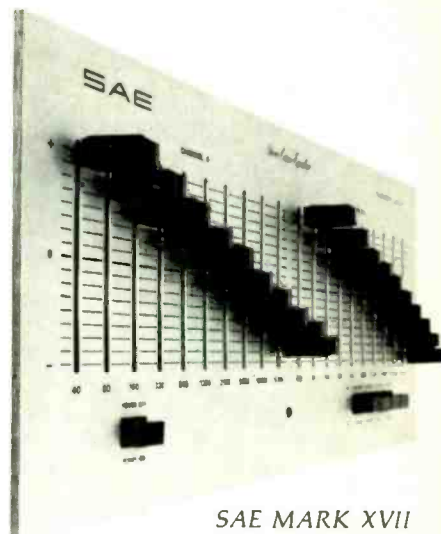
If you're looking for the general situation, I personally prefer a good dynamic microphone for tight miking and a good condenser microphone for overall sound. In general, I use five microphones and these are usually dictated by what's available. My normal complement is a Sennheiser MD 421 in a well-packed and muffled bass drum, a Sennheiser MD 421 on snare, a Shure SM 53 on mounted tom, and another Sennheiser MD 421 or AKG 1000E on the floor tom. I then use a Neumann U87 as my overall mike, generally placed above and in the center of the entire drum set.

(2) Since you say "once recorded," I must assume that the placement referred to is the position within a stereo mix. I don't believe that any particular position may be said to be better than any other. Again, this is a matter of personal preference and is usually completely up to the producer. If you're looking for the best definition on the individual parts of the drum set, spread out the instruments in your mix. If you're looking for power and drive, then they should be focused in or near the center of the mix. By placing the percussion in the same area as the drums they can become lost, although it might tend to add more power to the mix. I personally prefer placing the percussion away from the drums, which gives better definition and a motion to the mix—especially if there is an interplay between the drums and percussion.

(3) I believe that all parts—whether lead, harmony or background—should have as much presence as possible. For the final mixdown, the presence and position of the vocals depend upon the arrangement of the song, the type of music and, most important of all, the feel. Generally, the harmony or background will be behind the lead.

Music in itself is an emotion and cannot be programmed or nailed down—a point that I feel is overlooked by many people involved in recording. Likewise, recording has its own integral life, and should be felt rather than programmed. There are no set patterns. It's strictly the process of creating an artistic emotional experience—a product of many integral elements

The \$300 alternative.



SAE MARK XVII
Dual-Channel Equalizer

Your tone controls are just not designed to compensate for

- Room acoustics
- Speaker placement
- Old or bad recordings

We built the Mark XVII Equalizer to solve these problems and more.

These are some of the ways:

- Individual Octave Control for each channel
- Long throw, oil-damped linear slide pots for greater accuracy
- Dual range operation (controls operate over either $\pm 8\text{dB}$ or $\pm 16\text{dB}$)

Plus

- Capable of driving any system
- Low distortion—less than 0.03% THD and IM
- Low noise—greater than 90dB
- 5-year parts and labor service contract
- SAE's reputation as the finest manufacturer in the audio field

You'd have to look a long time to find an EQ that delivers this much value. SAE innovation has done it.

Components for the connoisseur.



Scientific Audio Electronics, Inc. MR-2
P.O. Box 60271, Terminal Annex
Los Angeles, California 90060
Please send me the reasons (including available literature) why the SAE MARK XVII Dual-Channel Equalizer is the "\$300 Alternative."

NAME _____
ADDRESS _____
CITY _____ STATE _____ ZIP _____

CIRCLE 14 ON READER SERVICE CARD

and the instincts of the producer who puts all the elements together.

—Neal Ceppos,
Generation Sound,
New York, N.Y.

What Causes Pre-echo?

In some recordings you can hear the first couple of bars of a song before the actual recording starts. Is this due to tape print-through?

—Susan Norton,
Los Angeles, Cal.

Probably not. Print-through is an unwanted transfer of information from one layer of tape to the next. This could cause a similar effect, but studios are careful not to stretch their tape tails out and attempt to store the tapes under proper conditions.

What you're hearing is groove echo, which occurs when the cutting of one groove deforms the adjacent groove. This can be minimized by cutting fewer grooves per inch—and at a lower level. However, recording companies and producers like to cut masters as "hot" as possible so that the recording will stand out when broadcasting over the radio. Also, cutting fewer grooves per inch decreases total playing time, which is undesirable. So a compromise must be made and this often results in audible disc echo on the lead-in groove; but the echo is masked by the real information once the actual recording begins.

—Jim Furman,
Furman Sound Studios,
San Francisco, Cal.

Noise Reduction Negligence

With the new Scotch "250" and Ampex "Grandmaster" audio recording tape, when would a person start to really worry about noise reduction—when mixing two, four, eight or 16 channels?

—Ken Wilhelm, Media Producer
Evergreen State College

In eight years of multi-track recording, I've found the improved quality of the new 250 and Grand Master series tape to be a real advance in our quest for signal over noise.

With the introduction of modern noise reduction systems, I strongly

believe that if you store audio (i.e., music or *any* recorded sounds) with any recording system, it would be gross negligence on the part of any serious recordist not to avail himself (or herself!) of the benefits of these very effective "tools" of our trade.

Even when the best tape is used, though—on mono through 40 tracks—basic particle noise and print-through rear their ugly heads and cause some real problems. It has been shown that even the latest tape formulas are susceptible to print-through by virtue of their higher mid-range outputs.

I would refer you to an excellent article by Angus McKenzie in February '75 *Studio Sound* magazine entitled "Recording Tape" which should give a much clearer picture of why "tracks" versus noise reduction is not the question at all. Rather, how much noise reduction can you *not* afford?!

—Ken Sands,
United Sound Systems,
Detroit, Mich.

Mixing and Phasing

Do engineers usually do different mixes for mono, stereo and quad versions of the same material? What common problem should I keep in mind when mixing?

—John Stone,
Anaheim, Cal.

It is advisable to do separate mixes because there are enough problems in getting a good mono, stereo or quad mix without having to deal with the others. For example, when a stereo mix is played in mono, the information in the center (on both the right and left tracks) will be boosted 3 dB. This results in the apparent loss of much of the outside information.

In any case, when mixing, be conscious of phase relationships. Keep instruments with a lot of bottom end away from the edges or you'll get large vertical excursions on the disc which can cause skipping. You can check your phase relationship with a phase correlation meter or an oscilloscope. For stereo, set the left channel to the Y axis and the right channel to the X axis. If the information is in phase, the pattern will lean from bottom left to top right. If the information is out of phase, the pattern will lean from top left to bottom right.

Also, there are professional devices such as the Neve Stereo Width Control, the Orban Stereo Matrix and the Holtzer Compatible Stereo Generator that can convert your stereo mix to a compatible mono mix.

—Keith Olsen
Freelance engineer

Disc vs. Tape

(1) How exactly does multi-speaker reverberation work? Is ambiophony the same as multi-speaker reverberation? (2) What are some of the short-comings of disc recording systems and magnetic tape systems? Which do you believe is the better of the two?

—Chris Glen, New York, N.Y.

(1) Ambiophony . . . do you mean Ambisonic? If so, that is related to multi-speaker reverberation, which is when room reverberation is captured and stored as a three-dimensional "picture" of the acoustic characteristics of a particular auditorium, hall, etc. It is not a usable concept as yet.

(2) Any discussion of disadvantages should include the advantages for comparison. Perhaps if we answer the first question, the answer to the second part may become evident.

Disc is a medium which requires very expensive precision equipment to record only a simple two-channel program. The equipment must be accurate to millionths of an inch, is delicate and requires a fair amount of training to operate and understand. Many physical problems abound in disc recording also. There is the limitation of available space which results in a trade-off of recorded level, time and bass response. Then, even if there is enough room to cut a hot level, there are the limitations of the playback equipment to track these high levels. Actually, the cutter can put incredibly high levels on the disc. Most of the problems arise in getting the signal off the disc.

On the other hand, an acetate disc or master record has a signal-to-noise ratio of better than 70 dB, unaided by any type of noise reduction systems. Compare this to a tape recorder—which at best is only 60 dB above the noise of its medium.

Then, there is the obvious advantage of much higher quality available for an inexpensive price with mass

STEVIE WONDER

AND MU-TRON III

PATENTS PENDING

down beat

Pop
Musician
of the Year!

Plus honors in
these Down Beat
39th Readers Poll
categories:

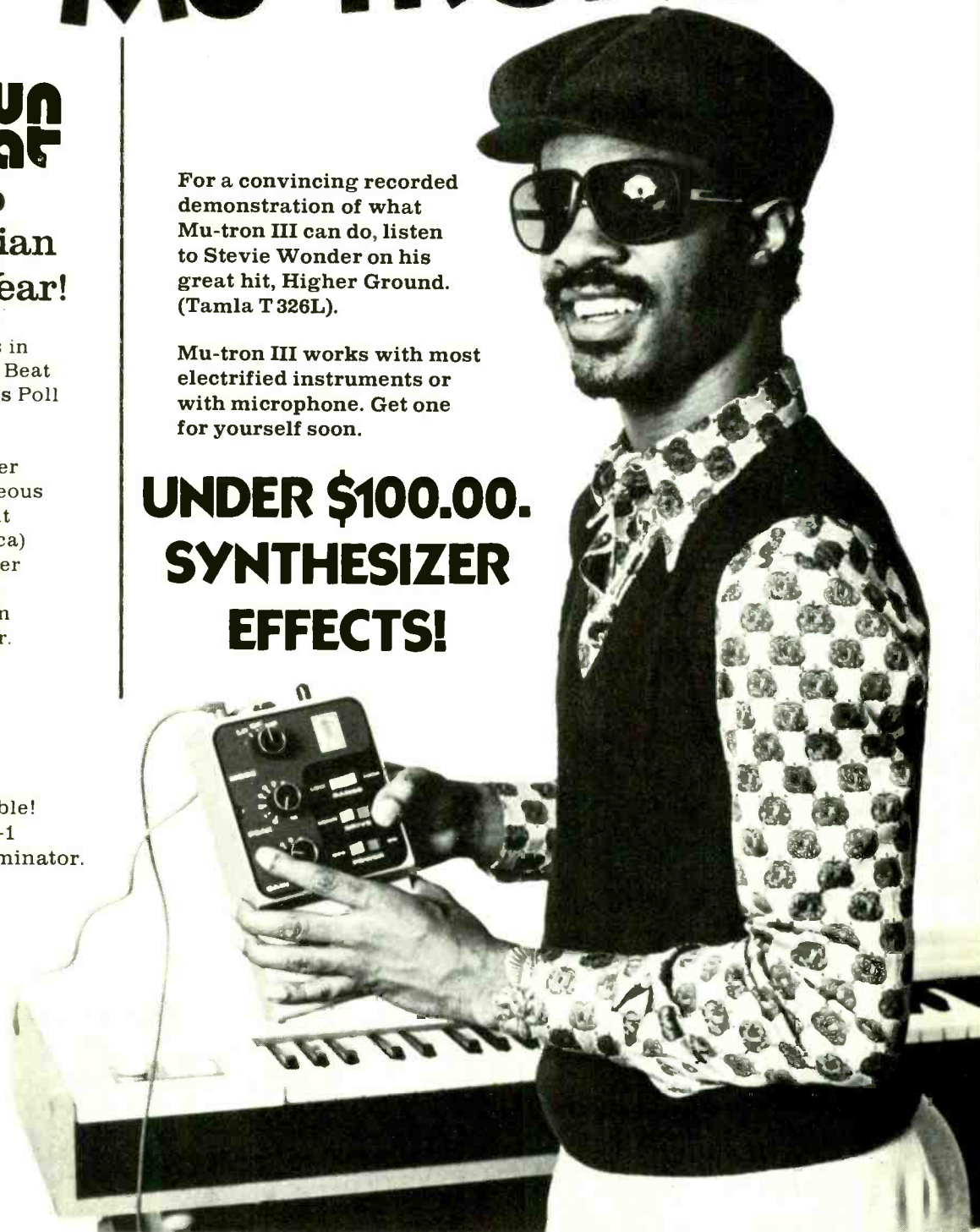
- Synthesizer
- Miscellaneous
Instrument
(Harmonica)
- Male Singer
- Composer
- Pop Album
of the Year.

Now available!
Mu-tron PS-1
Battery Eliminator.
\$19.95.

For a convincing recorded
demonstration of what
Mu-tron III can do, listen
to Stevie Wonder on his
great hit, Higher Ground.
(Tamla T 326L).

Mu-tron III works with most
electrified instruments or
with microphone. Get one
for yourself soon.

UNDER \$100.00. SYNTHESIZER EFFECTS!



For catalog sheet and name of nearest dealer, write:
MUSITRONICS Corporation, Sound Lab 12, Rosemont, New Jersey 08556

7871

Also Available: Mu-tron Phasor, \$129.95 · Mu-tron Bi-Phase, \$279.95

CIRCLE 50 ON READER SERVICE CARD

production. Mass-produced tapes take longer to mass-produce, are of comparatively horrendous quality and are expensive. Also, skipping to a desired selection is not as easy with tape as with a disc. But records cannot be edited, become noisy quickly and, as foreign matter settles in the grooves, the groove walls get deformed. Tape does not wear out in practical application, but just the idea of a diamond spike under tons of pressure being dragged through a crazily zig-zagging groove makes one wonder how a record lasts as long as it does.

Tape is a very forgiving medium. That is, you can exceed normal record levels, put too many highs on the tape and perform a variety of abuses on a tape system without damage to the equipment or causing noticeable distortion. Disc is absolute. If you exceed a design parameter just once, there will instantaneously be damage and the program will be rendered useless. One mistake and it's all over. Tape recorders usually survive with almost any kind of idiot at the controls.

Thus, it depends on what your requirements are as to which is the most favored. If quick retrieval or relatively inexpensive product and playback equipment are important, disc is the answer. If ease of production is mandatory, it is tape that gets the nod. In practice, you need both tape and disc for the advantages of each—and in turn we must put up with the disadvantages of each.

—Dave Moyassidis,
Frankford/Wayne Recording Labs,
Philadelphia, Pa.

Is dbx Better?

(1) I've read that the dbx system greatly increases signal-to-noise over Dolby. How does it work and are there any drawbacks?

(2) So much has been said about the evils of fast rewind-forward, but how is it possible to listen to a selection in the middle of a reel-to-reel tape and not rewind before storage?

—Bill Gray
Augusta, Georgia

Even though the dbx system is now being accepted as the new standard for noise reduction, there still remains a mystique in the minds of many people about the how's and

why's of its operation. Unlike older noise reduction concepts which offered 10 to 15 dB of tape noise reduction, the dbx approach is unique: the dbx method achieves a minimum of 30 dB of tape noise reduction, as well as a 10 dB increase in tape recording "headroom."

The dbx system is somewhat tricky in concept, but basically simple in operation. The system involves a wide-band linear decibel 2:1 compressor with pre-emphasis in record, and a 1:2 expander with de-emphasis in playback. This is to say that, when an input signal having a 100 dB dynamic range is fed into a dbx "record" stage, the 2:1 compressor reduces the dynamic range to 50 dB, while at the same time adding frequency weighting (pre-emphasis) to the signal being recorded. In playback, the 1:2 expander restores the recorded 50 dB dynamic range to the original 100 dB dynamic while using a "mirror image" frequency weighting curve (de-emphasis) to assure flat code through decode frequency response. The frequency weighting networks are, in large part, the systems which render tape hiss inaudible. The use of wide-band full-frequency linear decibel compression means that no level match or "pilot" tones are necessary for code/decode tracking accuracy when using dbx.

The only drawbacks which one could encounter when using dbx would be anomalies in recorder frequency response, and improper record bias. In a linear decibel companding system, a recorder's frequency response errors could be magnified. Improper record bias may sometimes lead to envelope hiss modulation, sometimes called "modulation noise."

—Dave Purple,
Sales Manager, dbx

[Mr. Purple is also personal engineer for Isaac Hayes—*Ed.*]

In reference to your second question, there are two solutions to this problem that I know of:

(1) Select fast forward as usual, and as the motors pick up speed, apply a small amount of pressure with your thumb on the feed spool. This will give the tape tension and it will lie flat on the take-up spool. Sometimes the spooling motors on domestic machines are not powerful enough to take this extra pressure. If this is the case, then this next method should work:

(2) Select fast forward, but this time test a period edge onto the tape between the capstan and take-up reel. By applying downward pressure and "bending" the tape slightly, you will find that the tape will again lie flat on the take-up reel.

—Mike Jones,
Sounds Interchange Limited
Toronto, Ontario



Mics and Radio Interference

My microphone (or mic lines) sometimes picks up radio interference. What can I do about this?

—Thomas Z. Richards,
Las Vegas, Nev.

The first thing to do is to check your grounds and connections and make sure you're using high-quality shielded lines (graded, not spiral). If this doesn't clear up the problem you may have to go with low-impedance mics with balance lines (the shield is grounded and the two mic wires carry the signal voltage). If you're still having problems try investing in an RFI filter. There are several out on the market.

—Jim Furman,
Furman Sound Studios,
San Francisco, Cal.

"Bouncing" Tracks

I have read your magazine, and must say I really enjoyed it. I was very much interested in the "talkback" column, as I myself have a few questions. However, the thing I am most curious

to know is if you could please explain what is meant by "bouncing" tracks?

—Rob Strasser,
Fairhaven, N.J.

When "bouncing" tracks, one takes the signal from one or more tracks on a multi-track machine and electrically moves them to other tracks on the same tape in order to open up new tracks.

For instance, you have a situation on a 16-track tape where you have 15 tracks full and one track open. Now you decide that you want to add strings and horns which might use as many as four tracks. You realize that five tracks are background vocals which could be combined to one track — five tracks to one open track of a 16-track machine. Echo and EQ can be added during the bounce to bring it closer to a more finished sound for the mix.

In order to take advantage of the four new tracks, the original signal must be erased and those tracks used for horns and strings. The fifth track is left open for further bounces.

—Shelly Yakus,
Chief Engineer,
Record Plant,
New York, N.Y.

Home Recording Hum— Two Questions and Answers

I recently purchased a semi-professional four-channel tape deck which I had intended to use primarily as a "live" recording medium. When feeding directly from auxiliary sources, the deck performs flawlessly. However, when recording (and overdubbing) my own performances, an annoying hum is present when working through the mic inputs. The intensity of the hum varies slightly when the position of the mic is altered.

The mics are high impedance with a single-conductor shielded cable. Could this hum be eliminated by using a cable with two conductors and a shield? And if this is done, would a line transformer be required to go from the now-balanced line to the unbalanced condition of the mic inputs on the deck?

Thank you very much for your prompt attention to this matter.

MICROPHONES

Shure PE 56D

High Impedance

Output Level—54.5 dB (1.88 mv)

below 1 volt per microbar

SIBLING RIVALRY



Which one you like best depends on
what you want to do with it.

Our Ultra Dynamic cassette can play back every note your system can record.

Or, for a few Hertz less and a lot of cents less, you can have quality almost as good in our Low Noise cassettes. (It's so good, many people compare it to our competitors' top-line products.)

However, both cassettes feature Maxell "tensitized" tape strength to pre-

vent stretching. Both Maxell cassettes feature the strongest shells made to prevent warping and popping. Both cassettes come in 120 minute lengths that really work.

So, while our two cassettes have a few differences, they're all in your favor.

Maxell Corporation of America, Moonachie, New Jersey 07074. Also available in Canada.

maxell

For professional recordings
at home.



CIRCLE 4 ON READER SERVICE CARD

TAPE DECK
Akai GX 400DSS

Mic Input—0.5 mv/4.7 kilo-ohms

Line Input—100 mv/50 kilo-ohms

—John M. Vitkow,
Darby, Penn.

Don't use the mic that you're presently using. Get a low impedance mic with a two-conductor shielded cable. Use a Shure A-97A line-matching transformer at the tape-machine input.

The problem is that you are using a high impedance mic and a long single-conductor high-impedance cable.

—Pen Stevens,
Chief Maintenance Engineer,
Record Plant
New York, N.Y.

Most of my recording is done "live," i.e., rock concerts, classical orchestras and speeches. Before recording, I spend a couple of hours checking everything! However, more times than not, when recording quiet passages or speeches a fairly audible hum arises. It's not a broken shield. Also, I made sure no dimmer board or equipment with SCR's was around. This appears both with a mixing

board and without one. Could it be the XL connectors touching the floor?

—Chris Walker,
Charlotte, N.C.

"Hum" is usually attributable to a ground loop (multiple grounds), broken mic line shields, electrical interference, or improper power supply regulation in the equipment used. All of these involve seeing and testing the equipment you are using, and because I can't, I recommend taking your unit to a well-qualified tape recorder technician.

—John Calder,
Kendun Recorders,
Los Angeles, Cal.

Setting Bias and EQ

Can you explain how to go about setting the bias and equalization on a reel-to-reel machine with controls provided for this purpose?

—Keith Bobitt,
Columbus, Miss.

(A) *Playback Alignment:* Get a NAB standard alignment tape, set the playback level and run the response and alignment check. Then

adjust the playback equalizer and check playback amplifier noise level.

(B) *Bias Tuning:* With the machine in the "record" mode, check that the erase reading on the meter is 100% or better ("0" on the VU meter). Switch the meter to bias position and set Bias Adjust control for a convenient reading. Next, rotate the Bias Tuning control for maximum reading on the VU meter.

(C) *Bias Adjust:* With unit operating in "record" mode, feed a tone into the recorder so as to produce reference level on the VU meter with the monitor switch in playback setting. Now, rotate the Bias Adjust control for a peak reading (at 15 ips use 1000 cycle tone, 7½ ips 400 Hz, 3¾ ips 250 Hz).

(D) *Bias Calibrate* (Bias level): After adjusting the bias, switch the meter to bias position and zero the reading by rotating the Bias Calibrate control.

(E) *Record Calibration:* While recording a 1000 Hz tone at a level of zero on the playback setting of the VU meter, switch the meter to the "record" position. Adjust the Record Calibrate control so that it, too, reads zero on the meter.

(F) *Record Frequency Response:* Put on a reel of blank tape of the type to be used. "Record" a tone no higher than the reference level on the VU meter with the speed at 15 ips. Sweep the oscillator frequency up to 15 kHz, observing that the output remains within the specifications. Then check "record" azimuth for best performance at 15 kHz and retrim record equalizer if required. If the machine is out of spec, first adjust azimuth at a lower frequency, about 5 kHz, before making the final adjustment at 15 kHz. Repeat the entire procedure 20 dB below reference level for 7½ ips tapes. For 3¾ ips machines, the procedure is identical with the 7½ ips except that the maximum adjusting frequency is 7.5 kHz.

(G) *Overall Frequency Response:* Sweep the audio oscillator from 35 Hz to 18 kHz (at 15 ips) and observe the meter readings with the VU meter monitor switch in the playback position. Repeat for lower speeds 20 dB below operating level.

—Jeff Ader
Masterhouse Recording Studios,
New York, N.Y.

dbx eliminates tape noise when connected to any reel-to-reel recorder. You can make original recordings with no audible hiss or background noise, which even the most expensive studio recorders cannot achieve using conventional noise reduction systems.

dbx 157 is a two-channel simultaneous tape noise elimination system which permits monitoring off tape while recording. It is fully compatible with all dbx professional studio systems and costs \$600.00 from professional audio dealers. Switchable (record or play) 150 series noise elimination systems start as low as \$187.50 per channel.

For complete product information and a list of dealers serving your area, circle reader service number or contact: dbx, Incorporated, 296 Newton Street, Waltham, Massachusetts 02154, (617) 899-8090.

dbx eliminates tape noise



dbx inc.

CIRCLE 20 ON READER SERVICE CARD

OVATION SOLID BODIES

They're worth a try!



On the road or in the studio, Ovation solid bodies offer serious guitarists the most flexible electric guitar yet. One beautiful instrument delivers the sounds of today's most popular guitars plus a few surprises of its own. Advanced technology and a keen eye for design have created the Breadwinner and Deacon series. Both are made from the finest Honduras Mahogany and equipped with a 2-full-octave, 24-fret fingerboard. And both series benefit from Ovation's revolutionary breakthrough in pickup design and function. Imagine, pickups that are a full 20 db quieter than humbuckers, tone and volume controls that respond to each number on the dial and a built-in phase switch that all combine to create the varied sounds of the Deacon and Breadwinner.

Ovation solid bodies—
they're worth a try.

Get a free Solid Body Catalog

Write:

Ovation Instruments Inc.

Greenwoods Road

New Hartford, Conn. 06357

Name _____

Street _____

City _____

State _____

Zip _____

A **KAMAN** COMPANY

CIRCLE 7 ON READER SERVICE CARD

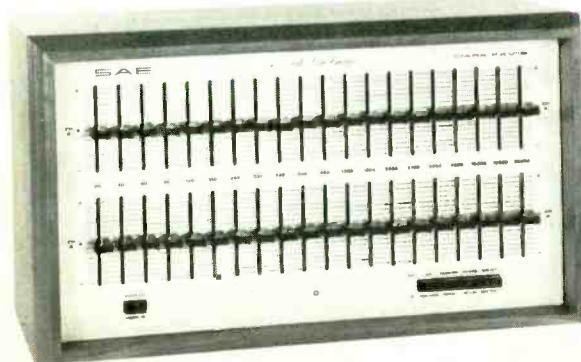
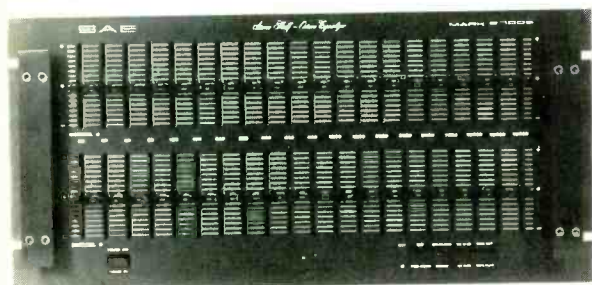
THE **PRODUCT** SCENE

By Norman Eisenberg



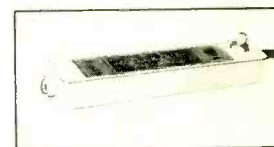
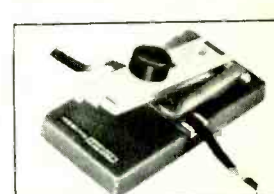
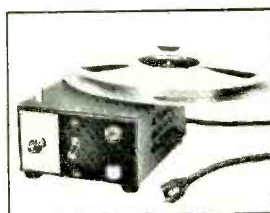
SAE'S HALF-OCTAVE EQUALIZERS

L.A. manufacturer SAE (Scientific Audio Electronics, Inc.)—perhaps best known for its high-powered amplifiers—has announced two new equalizers, the model 27B for home use, and the model 2700B, a rack-mounted unit for professional applications. Prices are \$550 and \$600, respectively. The equalizer incorporates a pink-noise generator, and features slide controls that provide up to ± 16 dB range at any or all of twenty frequency bands per channel in half-octave steps, and with harmonic distortion rated at less than 0.02 percent. Either unit is claimed to be useful in overcoming room resonances, and to compensate for other deficiencies in the listening environment and in speaker systems. The equalizers also may be used to make pre-equalized tapes. Output circuitry can deliver 11 volts RMS into a 600-ohm load.



CIRCLE 60 ON READER SERVICE CARD

BULK TAPE ERASERS



No less than eight types of bulk tape erasers are now offered by Robins Industries, longtime manufacturer of audio accessories. The erasers range from a \$26 "Universal" model (recommended for the average home tape user) to the \$320 TM-120, a heavy-duty type for commercial and professional applications. Other models include special designs for cassettes and 8-track cartridges, and an audio/video model. Other Robins products include phono and disc cleaners; disc and album covers; various phono accessories such as stylus gauges and microscopes; tape lube kits; cassette cleaners; head degaussers; splicers; editing kits; spare reels; mailers; test tapes; dynamic expander; speaker protector; cassette rapid rewinder; assorted plugs, cables, jacks, adapters; blank tape.

CIRCLE 74 ON READER SERVICE CARD

AKG MICROPHONES, ETC.

A wide range of microphones and accessories is available from AKG, whose products are distributed here by North American Philips through its new operation known as Philips Audio Video Systems Corp. Literally dozens of units have been announced in all classes and styles and with varying directional pickup patterns. Table and floor stands, windscreens, suspensions, shafts, cables, adapters, and so on are also being offered. Literature, available from the company, describes the entire line generally. In addition there are detailed in-depth technical studies of specific items. AKG's other big product group is headphones of which a very late model is the K-140, dynamic and very lightweight (6.2 ounces), with a rated response from 20 to 20,000 Hz. The K-140 lists for \$34.50.



CIRCLE 77 ON READER SERVICE CARD

NEW HEADPHONE LINE



Five new headsets have been announced by Audio-Technica, the relatively new audio firm known up to now for its phono pickups and disc cleaners. The headsets include three dynamic models and two electret-condenser types. All are bi-polar (open-back) which the firm claims makes for smooth response plus ease of wearing. The dynamic models weigh 9 ounces. They all are of low impedance (4 to 16 ohms). The \$39.95 model AT-701 claims response from 30 to 20,000 Hz. The model AT-702, at \$49.95, is rated for response from 25 to 20,000 Hz. The top dynamic is the model AT-703 which costs \$69.95 and claims response from 20 to 20,000 Hz. In the condenser group, there's the \$79.95 AT-707 and the \$129.95 AT-706. The AT-707 has permanently polarized diaphragms that need no external power source; it plugs directly into any normal headphone jack. Impedance is 4 to 16 ohms; weight is 10 ounces. Response is rated from 20 to 20,000 Hz, or from 40 to 20,000 within ± 3 dB. The AT-706 requires no external polarizing voltage but is designed for use with a separate impedance-matching adapter that connects to any amplifier output. Its response is rated from 10 to 22,000 Hz, or from 20 to 22,000 Hz within ± 2 dB. Weight is 10.8 ounces. The adapter measures $3\frac{1}{4}$ by $3\frac{3}{8}$ by $8\frac{1}{2}$ inches.

CIRCLE 79 ON READER SERVICE CARD

NAKAMICHI EXPANDS PRODUCT OFFERINGS

Nakamichi, the firm known mainly for its ultra-high performing cassette recorders, expands its product offerings with headphones and microphones. The headset, model HP-100, is a dynamic type listing for \$50. Rated response is from 20 Hz to 20 kHz, impedance is 8 ohms. Output SPL is given as 90 dB \pm 3 dB/mW at 1 kHz. Maximum input signal is 500 mW. An eight-foot coiled cable is supplied which weighs 14.3 ounces.

The firm's mic offerings include the CM-1000 condenser microphone and a multi-element system known as the Tri-Modal. The CM-1000 has a supercardioid pickup pattern and may be powered from a battery supply or directly from a console (45-50 volts). Switchable 10 and 20-dB attenuator pads, plus a low-frequency roll-off network (-10 dB at 100 Hz) guard against amp and input overload. Also available for the CM-1000 is an optional pinpoint (super-omni) capsule, the CP-102. The CM-1000 comes with the capsule, a preamp, battery supply, windscreen, cables and swivel-stand adaptor at a suggested retail price of \$290.

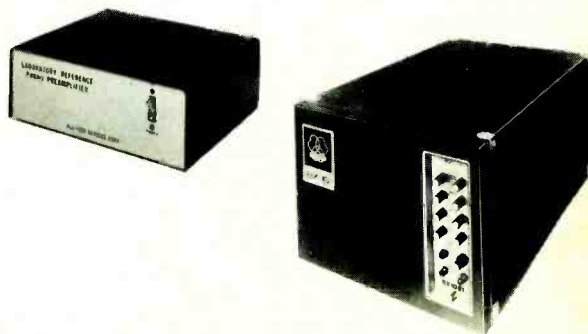
The Tri-Modal system is composed of three Nakamichi CM-300 electret condenser microphones. Each one comes with two capsules (a cardioid CP-1, and an omnidirectional CP-2) plus windscreens, cables, and swivel-stand adaptors. Also available are a special pinpoint (super-omni) capsule, the CP-3, and a shotgun with windscreen, the CP-4. Cost of the Tri-Modal, with case, is \$300. The CP-3 is another \$30; the CP-4, \$50. A booklet and specs are available from the company.



CIRCLE 69 ON READER SERVICE CARD

OUTBOARD PHONO PREAMP

From All-Test Devices Corp., manufacturer of a wide variety of electronic and transducer products, comes word of its model ATD-25 Laboratory Reference Phono Pre-amplifier. Designed for patching between a turntable (with magnetic pickup) and the high-level inputs of an amplifier, the ATD-25 conforms to within \pm 0.5 dB of the RIAA standard equalization curve over the range from 20 to 20,000 Hz. Gain at 1 kHz is given as 36 dB (56 dB overall when feeding average high-level inputs). Stereo inputs and outputs are at the rear; a power off/on switch is on the front. The unit lists for \$150. Other items from All-Test include several transducers for "live" instrument pickup ranging from a \$39.95 guitar model to a \$299 piano unit. Among the firm's sound modification products are volume pedals, battery eliminator, six-channel mixer and a transducer preamp/booster.

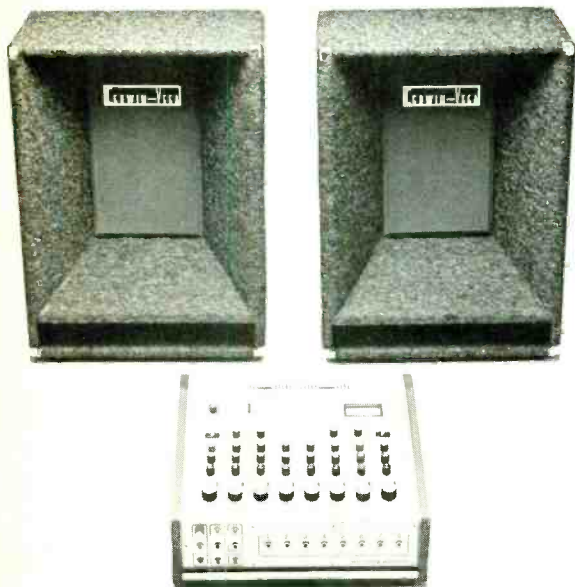


STEREO PORTABLE REVERB UNIT

Recently made available is the AKG BX-10, said by the manufacturer to be the first truly portable two-channel reverberation unit designed to provide the quality and features needed in studio work. Based on the torsion-transmission-line principle used in the firm's larger BX-20 model, the smaller version provides for independent decay-time adjustment, high- and low-frequency equalization and reverb/dry signal mixing. Channels are electronically and acoustically separate. Motional feedback permits decay-time adjustment during program material. The reverb/dry mixing feature permits adding reverb without the need for a reverb-return mixer in the mixing desk. Decay time is switchable at 1.5, 2.5, or 3.5 seconds. The BX-10 lists for \$1795. Full details and specs are available from Philips Audio Video Systems Corp. which distributes Austrian-made AKG products in the U.S.

CIRCLE 65 ON READER SERVICE CARD

P.A. SYSTEM SPORTS VERSATILE MIXER



Cerwin-Vega, a company perhaps best known to hi-fi show visitors for its loud loudspeakers, has introduced the MM-3/V-30 P.A. system, consisting of an eight-channel mixer-amplifier and two of the company's V-30 speaker systems. The MM-3's built-in power amp is rated to produce up to 275 watts (RMS) at less than 0.25% distortion. The mixer section includes a switchable 20-dB pad on each input to prevent amplifier overload, a peak-limiter calibrated to limit at the amplifier's clipping point, and a "preview" system that allows the operator to select any channel or combination of channels for monitoring via headphones. Also built-in is a reverb circuit which can double as a separate monitor mixer if desired. A special "freq-out" circuit gives effective control over feedback without affecting program tonal balance. Inputs and outputs allow patching in various accessories (e.g., graphic equalizers, electronic crossovers, effects devices). With the addition of extra amps and speakers, a multi-kilowatt system may be assembled.

The V-30 speakers consist of a 15-inch woofer and high-frequency horn in a cabinet 30 inches high, 24 inches wide and 16 inches deep. The V-30 is claimed to be at least four times as efficient as typical P.A. columns and has a rated response from 60 to 16,000 Hz. Suggested retail price of the whole system is \$1,798.

CIRCLE 44 ON READER SERVICE CARD

WHAT IS "LOUDSPEAKER" CABLE?

Among the assorted accessories you might find at an audio shop is wire labeled "speaker hookup cable." A good reason to view such a product skeptically is that there really is no such thing as "speaker cable." What it is, as a rule, is ordinary zipcord or, as it is called by the general public, "lamp cord." It is perfectly suitable for speaker hookups but you must use the correct thickness (gauge) to assure maximum transfer of energy from the amplifier to the speaker. The wire actually is a series resistance to the amplifier and as such it can alter the response of the system.

The correct gauge wire to use depends on the impedance of the speaker load and the distance between amplifier and speaker. And, of course, the lower the gauge number, the thicker the wire. If you're running speakers in a large studio and don't want to bother about calculating, or remembering anything, play safe and use the thickest wire you can find—this usually will be no. 14 gauge. It may not be as easily purchased as thinner types—your local friendly hardware dealer probably carries nothing heavier than no. 16 or no. 18 gauge—and it costs more than the other types.

You can use thinner wire of course. Here's a quick guide: No. 22 gauge (really thin wire) can be used for 16-ohm speakers up to 40 feet from the amplifier, for 8-ohm speakers up to 20 feet, and for 4-ohm speakers up to 10 feet.

No. 20 gauge may be used for 16-ohm speakers up to 75 feet, for 8-ohm speakers up to 40 feet, and for 4-ohm speakers up to 20 feet.

Use no. 18 gauge for a 16-ohm speaker up to 100 feet, for an 8-ohm speaker up to 50 feet, and for a 4-ohm speaker up to 30 feet. (No. 18 by the way is the most common gauge found in ordinary lamp-cord).

No. 16 gauge is recommended for 8-ohm speakers up to 100 feet and for 4-ohm speakers up to 50 feet.

No. 14 gauge, in addition to being okay for most any set-up, should be used for 4-ohm speakers that require a run of 75 feet. A 4-ohm speaker with a run of 100 feet should use no. 12 gauge.

So what is speaker cable? It's the size (thickness, or gauge) of wire suited to your installation, based on the actual distance of the wire required to reach a speaker, and the impedance of that speaker.

There's one kind of wire that definitely should not be regarded as speaker wire, and that's twin-lead ribbon (the kind used for antennas). It's too thin for many installations from an electrical stand-point, and it's relatively fragile mechanically.



THE HISTORY OF RECORDING

By Robert Angus

PART 2: The House that Rood Built (or The Vision of Charles Dexter Rood)

If Charles Dexter Rood had retired at the age of 65, he might well have gone down in the books which tell of the great 19th century New England merchant princes. Born on a farm in Ludlow, Mass. in 1840, his story might have served as the prototype for a Horatio Alger novel. But instead of taking it easy after an active business career, Charles Dexter Rood's path crossed that of the telegraphone, a

wire recorder which serves as the ancestor of all of today's recorders.

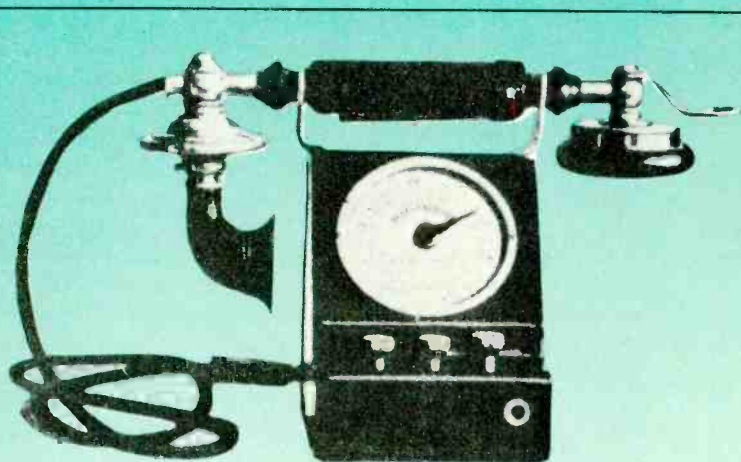
When Rood (in central Massachusetts where the family thrives today, the name rhymes with "good") was born, Ludlow was a small farming community some five miles east of Springfield. Today it's an industrial and residential suburb. Rood received his education at Williston Seminary, then set out to find fame and fortune in New York. His first job was with a firm of jewelry importers as a salesman on the road, and it paid \$500 a year. Shortly after he started work, Rood was offered the opportunity to go into the oil business in western

Pennsylvania. Oil at the time wasn't the big business it was later to become with the invention of the automobile. It served as a patent medicine, but Rood saw a future for it as a replacement for whale oil in home lamps.

However, a career in the oil business was not to be his. When he told his employers that he wanted to quit, they upped his salary to \$2500 a year—an unheard-of sum for a travelling salesman in the 1870's. Soon, he became a partner in the firm. Then in 1876, he was presented with his first opportunity to make real money. The New York Watch Company's plant had burned, leaving a pile of rusted machinery and an unemployed labor force. Rood sold his interest in his jewelry importing firm and used the capital to buy New York Watch. He packed up the company's few assets and shipped them to Canton, Ohio, where he founded the Dalber-Hampden Watch Company. The new company got off to a rocky start, and Rood occasionally had to go prospecting for outside capital. At one time, the company's directors considered borrowing to meet a dividend payment. Rood told them that if they did, they'd have his resignation in the morning. Eventually, however, the firm began to show a profit, and the company's president and general manager began investing his earnings in real estate—first in downtown Canton, later in timberlands in Michigan. By the time he sold the company in 1890, Rood had made it one of the most profitable of American watchmakers.

The Watch Man

Late that same year, another opportunity came Rood's way. Selling out his interest in Dalber-Hampden, he invested in the Aurora Watch Company of Aurora, Ill. The company had an unsavory reputation—not only with its dealers, who complained of shoddy merchandise, but with employ-



EXTENSION SET AND TELEPHONE CONNECTION ↑

Errors Quickly and Easily Corrected

If he makes an error, he runs the machine back, listens through the receiver on the hand set to his own dictation, and re-dictates that which is not satisfactory, at the same time erasing the former and unsatisfactory part of his dictation.

One of the early ads created for the fated telegraphone.

ees. In those pre-union days, Aurora had occasionally paid off its employees in watches and parts when cash ran short. The company's practice was to compute the salary equivalents in list prices for the watches and parts. The employees, if they wanted cash, had to go out and sell the merchandise themselves, usually at wholesale, or about 50 per cent of the price they had been charged. The trouble with this system was that, with rare exceptions, jewelers received their merchandise on consignment from the manufacturers. Since they didn't have to pay for anything they didn't actually sell, they weren't very good markets for watches or parts being sold by employees. In short, the employees had all the cards stacked against them.

Rood announced that the practice would cease. He told the directors that he would resign the day Aurora failed to meet its payroll in cash.

Two years after his purchase of Aurora, Rood had the opportunity to invest in the Lancaster Watch Company of Lancaster, Pa. Lancaster's business, like Aurora's, had been poor—but the plant was in better condition and the labor supply more plentiful than in Illinois. Rood promptly merged the two firms to form Hamilton Watch Company, and packed up parts, machinery and personnel from Illinois for the trip to a new home in Lancaster.

The move, at the time, was considered one of the biggest of its kind. Never before had a company of Aurora's size simply packed up its plant and moved a thousand miles. Rood moved with the plant to Lancaster.

During his 16 years as president, Rood made the name Hamilton synonymous with the running of railroads on time. He persuaded every major railroad in the country to equip its trainmen and conductors with Hamilton watches, and to use Hamilton as their official timepiece. Then he advertised the fact, and the public bought.

Rood reached his 68th birthday on January 1, 1908—a time when most men would have considered retiring. His progression through the jewelry business and watch manufacturing had made him a millionaire. And there were his real estate speculations. Lands he had bought in Canton when they had been cow pastures were now in the downtown business area. Accordingly, Rood sold his interest in Hamilton and friends thought he was about to retire to Springfield.

Rood and the Telegraphone

Then he heard about a marvelous new business machine which could do everything Edison's dictaphone could do for a fraction of the price. Whether Rood was introduced to the struggling finances of American Telegraphone Company by its president, Judge John Lindley of New York, or whether he learned about it on his own, Rood saw an opportunity to match his missed chance for a fortune in oil.

In May, the directors of American Telegraphone met in Washington, D.C. They had a problem. Although the company had exclusive rights to the patents of Danish inventor Valdemar Poulsen for a low-cost magnetic recording device and had raised some \$5 million through the sale of stock, it had failed to make a single telegraphone. True, there was a factory in Wheeling, W. Va., and some employees. But President Lindley told his associates that without some new capital soon, they would have no company.

While the board discussed this news, Lindley excused himself to make a long distance telephone call. The man he spoke to was Charles Dexter Rood, who told him that he would give the company all the capital it needed. All the directors need do was to issue 94,000 shares of new stock to Rood at a price of \$2 per share, yielding \$188,000 in new capital. Rood was to receive no salary. Instead, he was to get the difference between \$2 and the par value of \$10 per share as compensation for putting the machine on the market. At the annual stockholders meeting on July 30, Rood became president, general manager and a director. Lindley became vice president. Since Rood's was the largest single block of stock, he had effective control over the company—and he began exercising it by refusing to call board meetings.

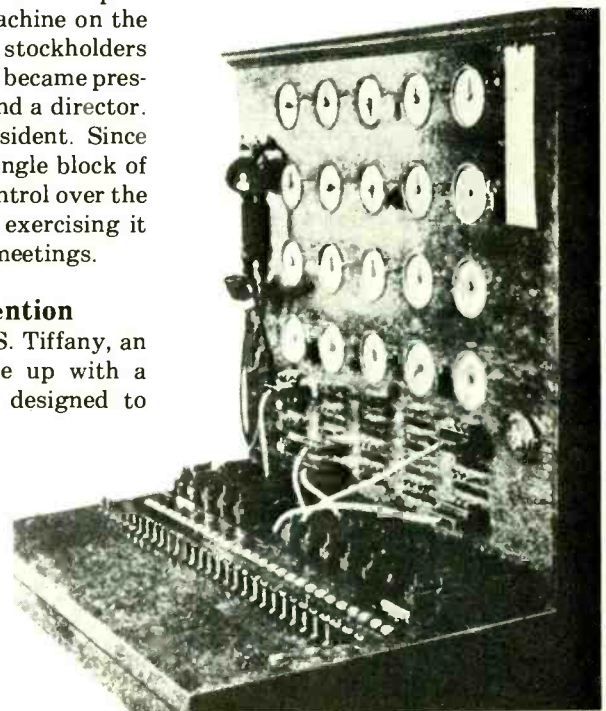
The Tiffany Invention

At the end of 1908, G.S. Tiffany, an American inventor, came up with a modification which was designed to

improve the operation and reliability of the telegraphone. As one observer described it, "The old telegraphone . . . arranged the spools of wire to take the record vertically and by reason of the vertical arrangement these spools were very free in their motion. They had a drag to keep it from running wild. But we all know the momentum of any spool that is arranged vertically . . . It was not what we call fool-proof . . . as the momentum of these spools would enable the wire to get slack once in a while; when this took place, the strand ran off the periphery of the spool, and you had a tangled wire to untangle.

"This Tiffany method . . . arranges the spools horizontally with carriers underneath each spool with a rod going through each carrier with spring fingers underneath a plate that travels on each carrier, and that carrier, with the spring finger, is alternately lifted and brought back to the condition of normal rest.

"These two carriers have a belt going from the motor under one, around the other, enabling these two carriers to travel always in opposite directions. The result is that when the machine is going forward, the carrier to your right is resting directly upon the right hand spool, cork inserts in carrier allowing for such slippage as will prevent any jerk, and insure evenness of operation. The other one, however, is



THIS TYPE OF SWITCHBOARD IS BEST ADAPTED FOR LARGE CONCERNS

elevated by a rod, and instead of resting on that carrier, the spring fingers hold two spools taut the other way, so when going backward, forward or at rest, the wire is always taut, a very ingenious improvement." An improvement, incidentally, built into the early home wire and tape recorders in the 1940's.

Poulsen was highly pleased with the Tiffany invention, and urged the company to acquire the rights to it. Rood seemed little interested, despite the prodding of members of the board of directors. His indifference continued the following year, when the U.S. Commissioner of Patents asked for an exhibit of the Telegraphone for the Alaska-Yukon-Pacific Exposition to be held in Seattle that year. Congress had appropriated money to finance exhibits of scientific marvels like the telegraphone, and some stockholders felt that the prestige of being invited to take part would be very good for business. Rood acknowledged the request, and agreed to furnish a model. But as the time for the show drew near and no model was forthcoming, company attorney John B. Larner demanded an explanation. Rood told him that the company was experimenting with new models.

Larner responded with a sharply worded letter: "I do not believe I can express my views any more strongly than I have stated them, and if I am to remain in the company, I want to see the by-laws lived up to in every sense." There was no direct answer; but directors suddenly found it difficult to find out what was going on at the factory. In a 1909 letter to the factory manager in Wheeling, Rood wrote, "Keep things to yourself because, as I know, information is like water. Spilled on the ground, it can never be gathered up again, and have your men keep all these things to themselves." Specifically, it was charged later, Rood didn't want the directors to learn about inactivity at the factory.

During his first three years as president, Rood managed to produce several machines in Wheeling. One of them was demonstrated for William J. Burns, founder and president of the detective agency which bears his name. Another appeared at the opening of the John Wanamaker department store in Philadelphia, to record the words of President William Howard Taft, the first on-location recording of a speech by a U.S. president.

Reliability

The principles used in TELEGRAPHONE construction are so simple that its reliability is at once assured. Records are made and reproduced by a new adaptation of electro-magnetism, and the method of making and reproducing is telephonic, and has all the reliability, all the ease of operation, and all the naturalness of tone production of the modern and most highly developed telephone.



DICTATING TO A TELEGRAPHONE LOCATED ON ANOTHER FLOOR

Early in 1911, over the strong objections of Larner and the other directors, Rood moved the plant from Wheeling to Springfield, Mass. where he was building a mansion in which to enjoy his later years. Manufacturing was to be done in a loft at the corner of Dwight Street and Harrison Avenue downtown, with a business office just around the corner at 468 Main Street. On a bluff about a mile away sat the Rood homestead—in such a position that the old man could overlook both the city and his facilities.

Secrecy and Procrastination

Rood's critics promptly labelled the new plant "little better than a barn, where nothing could be manufactured efficiently." They wondered out loud why he had abandoned the facilities in Wheeling, which they described as excellent. And Larner and the other directors did something—they walked out in a body, charging Rood with procrastination in putting a model on the market, bad judgment in dismantling the Wheeling factory, and excessive secrecy in keeping the directors from finding out what was going on. Rood's secrecy had gone one step further. By invoking the patent rights, he had managed to prevent any engineering textbooks or technical manuals from publishing technical descriptions of the telegraphone, or explanations of the magnetic recording principle which made it possible. As a result, the American scientific community which had responded so favorably to Poulsen's 1900 Paris demonstration, was unable to get any information about magnetic recording after 1908.

Unaware of the scientific information blackout, a stockholder named A.M. McCrillis of Providence, R.I. called on Rood to find out what was being done about manufacturing and sales. McCrillis, a salesman, could see a big potential among businessmen for a low-cost dictating machine whose wire could be used over and over again (you could re-use dictaphone cylinders several times, too—but you had to pare the excess wax off each time with a penknife). McCrillis wanted the exclusive sales rights to the machine. He later charged that when Rood saw that he wasn't about to be put off with further talk about "experimentation," the president demanded a personal consideration for granting him the contract.

On the strength of the agreement, McCrillis set up sales offices in five cities—Washington, Boston, Chicago, Philadelphia and New York, with a home office in Springfield. He wasted no time in calling in a reporter for the *Springfield Republican* and bedazzling him with tales of the telegraphone, its achievements and its potential.

McCrillis camped in the vicinity of the factory until he got some machines. Then Rood told him it was impossible to produce more because he needed a turning lathe. McCrillis, a quick-tempered Irishman, bought the lathe himself, and delivered it to Rood. His reward was 50 machines. He sold 20 of these to E.I. DuPont, which used them as an office dictating system until 1917. During the rest of 1911, probably the high-water mark in terms of income and production, American Telegraphone produced another 150

INTRODUCE YOURSELF TO DAK!

GET
A PAIR OF STEREPHONES

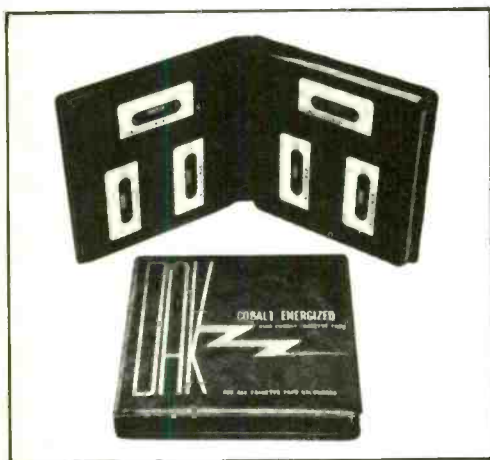
FREE

YES, DAK COBALT ENERGIZED CASSETTES AND SUPER LOW NOISE OPEN REEL TAPE ARE SO GOOD WE WANT YOU TO HEAR AND COMPARE THEM. JUST BUY 20 COBALT ENERGIZED CASSETTES (ANY LENGTH OR COMBINATION OF LENGTHS) OR 20 REELS OF DAK 7" X 1800' SUPER LOW NOISE OPEN REEL TAPE AND YOU WILL RECEIVE, ABSOLUTELY FREE, A DELUXE PAIR OF STEREPHONES.

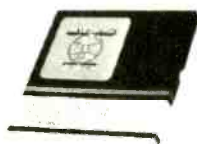
FREQUENCY RESPONSE 40-18,000HZ
RETAIL VALUE UP TO \$19.95



ORDER TOLL FREE
1-800-423-2636



Why DAK ????? or save COD charges and mail to address below
MAXELL. TDK and BASF are great -- but there is a professional magnetic tape, not as well known perhaps outside the Educational and Industrial area, but one which can surpass their performance. DAK is the only true manufacturer of blank magnetic recording tape that deals direct with the actual user. By dealing direct, we can save you up to 65% and you do not sacrifice quality. DAK doesn't make tape cheaper, but by eliminating the wholesaler, who makes up to 15% and the dealer who makes up to 40% or 50%, you save! We really do coat, calender, slit and assemble all of our cassettes. Send for our free catalogue of tape products and our book on how tape is made.



DAK Low Noise—High Output Scotch 207

DAK's Cobalt Energized Cassettes make chromium dioxide and special bias switches obsolete. Without any special circuitry or switches, DAK's Cobalt Energizing adds an impressive 3 to 5 db to the high end frequency response. That means more brilliant and true-to-life cassette recordings from now on with a response capability in excess of 22,000 Hz. The mechanical components utilized by these cassettes are of unsurpassed quality. In addition, special curved liners and greased pins and rollers are employed to keep a smooth tape wind and eliminate jamming. Hard windows are used to keep out dirt. All DAK Cobalt Energized Cassettes come with an unconditional one year moneyback guarantee in a deluxe hinged crystal box.

SPECIAL OFFER

Each DAK 6-Pack special, pictured above includes absolutely free with each six cassettes you purchase a handsome, richly padded, "midnight blue" cassette display vinyl case

BUY 20 INDIVIDUAL CASSETTES OR 4 6-PACK SPECIALS
TO GET YOUR FREE STEREPHONES

stock #	playing time	retail value	DAK direct prices!			*6-Pak Special
			1-9	10-24	25+	
HEC 40	40 min.	\$2.15	\$1.15	\$1.08	\$1.00	\$ 6.90
HEC 60	60 min.	2.50	1.35	1.30	1.25	8.10
HEC 90	90 min.	3.75	1.78	1.68	1.58	10.68
HEC 120	120 min.	4.75	2.65	2.55	2.45	15.90

DAK super Low Noise—High Output Magnetic Recording Tape offers the same excellent high frequency response and headroom associated with other high-performance tapes (like Scotch 207) ... but at a much more affordable price. In its May '73 issue, Audio Magazine tested DAK's new Low Noise—High Output tape along with several other well-known brands, including Scotch 207. Their conclusions about DAK: "... an inexpensive tape with excellent frequency response, good headroom ..." This professional quality, open-reel mastering tape utilizes a heavy-duty binder, and a fine quality polyester base to provide consistently low background hiss level and unusually long tape life. DAK tape is sold with an unconditional one year money-back guarantee.

BUY 20 REELS TO GET YOUR FREE STEREPHONES!

stock #	reel	length	1-24	25+
DO951-07G	7"	1800'	\$2.45	\$2.10

ADD 5¢ PER CASSETTE AND 10¢ PER REEL FOR POSTAGE 6% sales tax in Calif.

Offer Limited

10845 Vanowen St., North Hollywood, Ca. 91605 phone: (213) 984-1559

DAK INDUSTRIES, INC.



CIRCLE 45 ON READER SERVICE CARD

machines or so. McCrillis and his associate H.P. O'Reilly maintained an office at 40 Harrison Avenue, diagonally across the street from the American Telegraphone plant. They prepared and distributed a profusely illustrated booklet extolling the virtues of the telegraphone in business, showing the installation at the DuPont plant in Washington, Del. Price for a complete system, according to the booklet, was \$240—including foot control, extension set, phone jack and a connection plug for use with a telephone or other equipment.

One of the 1911 machines fell into the hands of Lee De Forest, the father of radio, then vice president of the Radio Telephone Company. De Forest realized that Poulsen's original idea of recording telegraph messages and transmitting them at high speed had merit, but felt that the telegraphone needed an amplifier to become commercially appealing. Accordingly in 1912, he demonstrated the telegraphone in San Francisco with an amplifier of his own construction. Rood was unimpressed, but did agree to lend him another telegraphone for experiments the following year. De Forest took his machine to the old 14th Street studios of Biograph Pictures in New York,

where he experimented in synchronizing wire-recorded sound with motion pictures. Rood failed to pursue this idea, and De Forest went on to develop the radio telephone instead.

When O'Reilly and McCrillis finally decided they weren't going to get the machines they wanted, they began canvassing minority stockholders for funds to wage a battle for control. They asked shareholders to contribute if they could, but guaranteed to protect the rights of all. After a number of court rebuffs, and after the Poulsen patent expired, O'Reilly founded the Record-o-Phone Company of Washington, D.C. to make telegraphones—and sought financing from the original stockholders in the parent company. In 1926, the attorney general of the State of New York was to enjoin him from further sale of stock in that state on the grounds that Record-o-Phone hadn't actually made anything. O'Reilly died the following year.

Gold Medal Winner

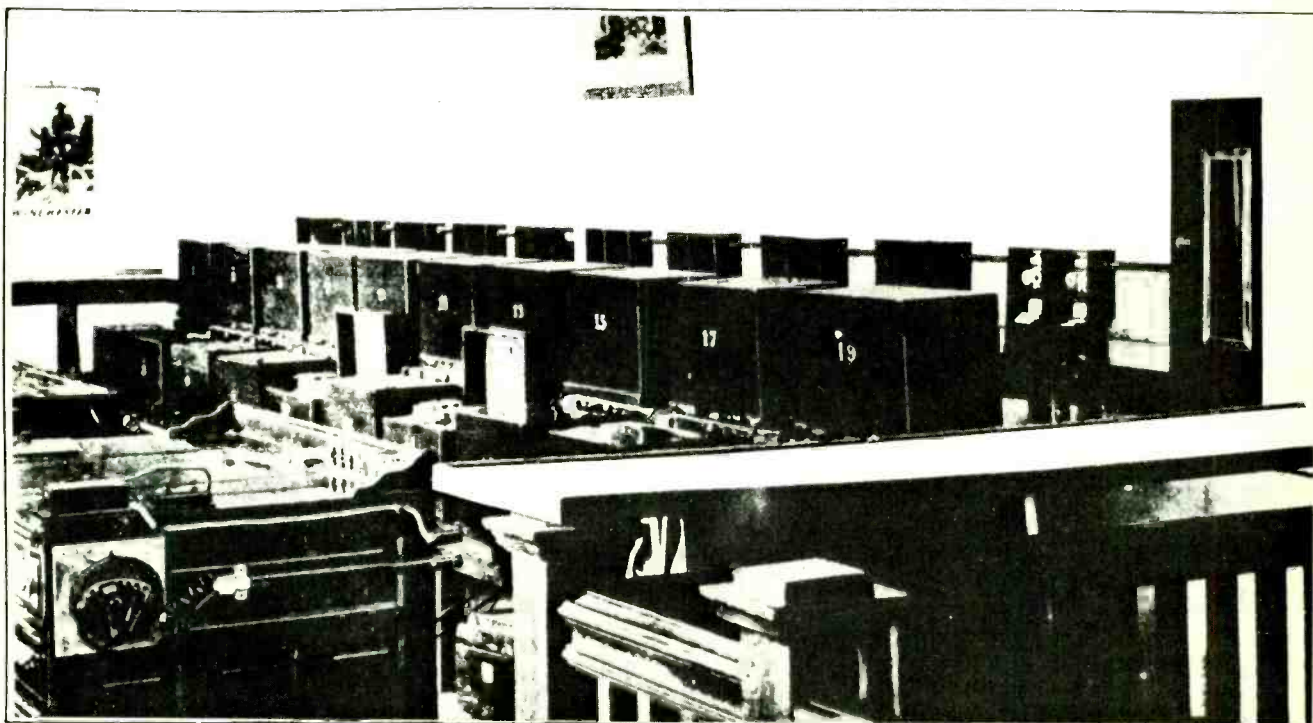
But we're getting ahead of our story. Toward the end of 1914, Rood got a letter from a stockholder named Frank A. Brittain, telling him that the Panama Pacific Exposition was scheduled to take place in San Francisco

early the following year. Wouldn't it be good publicity to have the telegraphone on display, he wondered. Rood didn't answer. So O'Reilly pursued the subject. Not only would a public display of the telegraphone generate needed publicity, he argued, but it would help McCrillis sell machines.

Rood didn't answer at first. When O'Reilly pursued the subject, Rood told him that he didn't consider the benefits worth the cost of shipping a machine to San Francisco. Besides, he said, he didn't have one to ship.

When the fair opened, there was a telegraphone on display. O'Reilly had dug one up somewhere and paid the display and shipping costs himself. The results appeared to pay off. The machine promptly won a silver medal, which normally would have assured it automatic coverage by every major scientific publication. This wasn't good enough for O'Reilly, who invited the jury back for another look.

Following the second visit and demonstration, O.H. Fernbach, secretary to the superior jury, wrote O'Reilly, "This is to notify you that after due consideration of your protest, the superior jury has raised the award made on your telegraphone from silver medal to gold medal."



THIS INSTALLATION OF TWENTY MACHINES ACCOMMODATES THIRTY-SIX DICTATORS AND REQUIRES BUT TEN TYPISTS SAVING ITS OWNERS \$100.00 PER WEEK

O'Reilly was in a jubilant mood. The top award could be promoted in company advertising, and there would be a rush of articles on this technical innovation followed by a rush of orders. Unfortunately, it was not to be. Rood had already notified any publisher likely to describe the machine in detail that he would consider such an article an infringement of the Poulsen patents. It was argued in retrospect that on the one hand, this was sound business practice to prevent other manufacturers from seeking a way around the patents; on the other, it prevented people from learning that there was such a thing as a telegraphone. Nevertheless, orders began streaming in on the strength of the award. Rood, by now 75, was to ignore virtually all of them. Just prior to U.S. entry into World War I, and unbeknownst to O'Reilly, McCrillis and the stockholders, Rood sold some telegraphones to the German government. By the time the war ended, the Poulsen patents had expired.

On Saturday, March 20, 1920, a trial began in U.S. District Court in Washington for control of American Telegraphone. Representing O'Reilly and his associates was George E. Sullivan, a prominent Washington lawyer. Rood was the defendant. By this time, American Telegraphone's chief assets were the Springfield factory and a supplementary patent obtained in 1914 on the Tiffany improvement. Sullivan argued that in the 12 years since he had assumed control of the company, Rood had failed to produce more than a handful of recorders that actually worked. Worse, he had turned down virtually every effort to publicize, advertise or promote the recorder. At the same time, the stockholders alleged, Rood had manipulated the stock to his own advantage, something relatively easy to do in those palmy days before the Securities & Exchange Commission. Sullivan said that Rood actually had gone so far as to deny directors any information about manufacturing and forbade the superintendent of the Springfield works to tell them anything.

Mr. Justice Stafford appointed a receiver to try to straighten out Telegraphone's tangled financial affairs. But the receiver had no funds to work with; and with the last significant telegraphone patents about to expire, there seemed little likelihood of raising additional capital by issuing new stock

or bonds. The stockholders gained a partial victory, but Rood and his controlling stock remained in power.

Very shortly, Sullivan was later to testify, Rood and the receiver worked out an arrangement in which the receiver returned "incriminating documents" to Rood. Shortly thereafter, Justice Stafford turned the case over to the court's auditor, who, one stockholder reported, "trifled with it for four years, granting occasional hearings, just enough to keep the judge from intervening."

The auditor, Herbert L. Davis, was surprised in his office one morning when Sullivan swooped down with a court order to seize certain papers. In Davis' wastebasket, Sullivan found torn-up correspondence, including a letter of introduction to Walter Gifford, then president of American Telephone & Telegraph Co. Sullivan implied that it asked Gifford for a personal favor. Davis replied that the letter was written not in his own behalf, but for his brother. What made it improper was that AT&T was involved in the pro-

When you're buying a mixer, read the small print first.

We're talking, of course, about the specs. Because they'll tell you right away just how good a mixer really is. And that's especially important when you've already got a quality recorder. Our Tapco 6200 has bass and treble controls on every channel. Complete stereo panning on every channel. Line outputs from every channel for quad recording. Line inputs on every channel for quad mixdown. 82 dB signal to noise ratio on balanced Low Z mike inputs. There's actually a lot more. Like the 6200's AutoPad automatic padding that virtually eliminates overload problems. And for complete recording studio capability at home, check the Tapco Graphic Equalizer and Reverberation System, too. The small print reads just as good.



TAPCO, 405 Howell Way, Edmonds, Washington 98020 (206) 775-4411

ceedings in Justice Stafford's court.

O'Reilly's first legal tangle with Rood actually had taken place two years earlier in Springfield. When he set out to organize the stockholders, he hired a lawyer, Henry W. Ely. Just before the stockholder meeting of 1918, Ely received a check from Rood's attorney, Charles S. Ballard. A covering letter with the check read, "We understand that in acceptance of this check you are to make no further charge against this company or against Mr. Rood, for your time and attention to the annual meeting or for the time spent either with Mr. Rood or myself, in making preliminary plans for future action. We understand this applies only to preliminary details for you stated very clearly you would charge and expect to be paid for services rendered in carrying out our plans for the future. The control of O'Reilly's proxies, his actions or whatever he may say at the meeting we expect you to handle."

Gab and Elapsing Patents

The Davis letter forced his resignation. In the meantime, Justice Siddons had taken over the case. Sullivan, who had replaced Ely, had a rather low opinion of the new judge, who spent an entire year on the case. "It's all gab, gab, gab as far as he's concerned," Sullivan told his clients. Finally, on June 27, 1927, the judge rendered a decision: there was need for a new receiver, and he appointed one. But since Rood's stock had been issued in exchange for faithful service,

he was allowed to keep it—and with it the title and power of president.

The trouble was that time was running out for Telephonograph's stockholders. The Tiffany patent—their last remaining asset—had only five years to run. Once it expired, anybody could make a telegraphone.

By now, O'Reilly was dead and Rood was liquidating his landholdings in Ohio to keep himself and his company afloat. Sullivan, not one to give up easily, finally managed to approach Sen. Arthur Capper of Kansas one day in 1930. Capper was a member of the Senate Patents Committee, and Sullivan showed him the seized records, the Davis and Ely letters, and sug-

gested that Congress could protect the stockholders by extending the Tiffany patent eight years—until 1940. This would give the stockholders a chance to reorganize, refinance and begin manufacturing in a new plant. Capper examined the evidence and told the lawyer, "Unbelievable, were it not for undisputable documentary evidence." He agreed to try for an act which would extend the patent—but he pointed out that the last time Congress had done so was in 1890, and then only for a minor design patent held by a patriotic society.

Congress had other things on its mind in those Depression years, and it took nearly two years for Sen. Capper to persuade his colleagues to look into the affairs of American Telephonograph. Finally, on March 9, 1932, the Senate Patents Committee took up the matter. On the same day, the House Patents Committee was conducting hearings on the destructive powers of New York theatre critics.

In Springfield, Rood had passed his 92nd birthday, granting an interview to the Springfield *Republican* in which he boasted of walking the mile to and from his office each day, and crediting abstinence from food and drink for his longevity. The family gathered to help him celebrate. What the newspaper stories failed to mention was the tangled Telephonograph affair and that one by one the banks which held the mortgages on his real estate holdings were foreclosing.

When it assembled, the Committee on Patents faced a dramatic display.

"In clearness of reproduction this wire instrument leaves nothing to be desired. The articulation could not be improved."—*The Scientific American*.



TRANSCRIBING NOTE ABSENCE OF MACHINE (WHICH IS LOCATED IN A DISTANT ROOM) ONLY HAND CONTROL NECESSARY

Fewer Errors

If the dictator exercises any reasonable care in his dictation, enunciates at all clearly, the percentage of errors is almost negligible. Ordinary letters may be signed without the trouble of reading.



DICTATING, TELEPHONE RECORDING, AND TRANSCRIBING MACHINE SUITABLE FOR SINGLE INSTALLATION. PRICE \$250.00

There was a Telegraphone, containing a recording of an Amos 'n' Andy broadcast made from a table radio next to it. Sullivan played the recording, then recorded the comments of the Senators. At their request, he demonstrated how easy it was to make deletions and edit the recording. There were exhibits of correspondence taken from what remained of the company's ransacked files. Rood did not appear, nor was he represented by counsel. Sullivan told the senators that he was "still living—but pretty near the end." The Committee raised the obvious question: who was back of what appeared to be a carefully planned suppression and why?

Why the Suppression?

Sullivan suggested that because it cost \$50 to make a Telegraphone and \$500 to make a Dictaphone, that the Edison companies could have good reason for wanting to suppress it. The phonograph manufacturers had pooled their patents in 1903 in order to limit competition. Had they also pooled forces to suppress the wire recorder? Adding to this speculation were references in Rood's correspondence to demonstrations of the telegraphone for the benefit of "the phonograph people."

Less secret, but much more puzzling, was the open hostility of the telephone interests. Sullivan admitted that this puzzled him until Col. H. Livingstone, a representative of American Telephone & Telegraph Co. testified in the Federal Court hearings that the Telegraphone was "a competent truth recorder of both sides of a telephone conversation and the voices of both speakers are not only recognizable but undeniable, so that if the instrument be made available to the public, the immense illegitimate use of the telephone in corrupt business schemes and social duplicity would suffer."

Sullivan then quoted the manager of the New York Telephone Company as saying that one-third of his company's business would be lost if a recording device (a major anticipated use of the Telegraphone) were attached to Bell Telephone's equipment. That was his estimate of the number of secret or illicit transactions by phone—use by bootleggers during Prohibition, gamblers placing bets, illegal business deals and the like. During the 1920's, in fact, Bell Telephone

Charles D. Rood, Veteran Business Man, Observes 92d Birthday Today



Charles D. Rood, with favorite dog Hunter, as he appeared last night.

Charles D. Rood, one of Springfield's oldest business men and former head of the Hampden and Hamilton Watch companies as well as a large holder of local realty, will observe his 92d birthday on Tuesday. He is working off his usual weekly schedule of the afternoon and holding a reception for friends at his home at Rowden street. Usually, he goes walks to town daily, and then returns home after a meal.

He was particularly active in the cause of the blind and for a time seriously engaged in the business of Titusville, Pa. From his first New York job at \$500 a year to his present job of \$1,000 a year, he has been active in the cause of the blind. He was particularly active in the cause of the blind and for a time seriously engaged in the business of Titusville, Pa. From his first New York job at \$500 a year to his present job of \$1,000 a year, he has been active in the cause of the blind.

began pressing state legislatures for laws forbidding the attachment of any unauthorized equipment or the use of recording equipment to telephone company property—a law which is

still on the books in some states.

The stockholder spokesman then brought up the most sinister chapter of all—one we shall examine next time involving the sale of Telegraphones to

Pictures - streets - Dwight St.

Landmarks Will Be Razed

*Feb. 17
1937*



(Republican Staff Photo)

The Springfield Five Cents Savings bank will demolish this four-story building at the corner of Dwight street and Harrison avenue and the two-story structure next to it on Dwight street, upon which it recently foreclosed a mortgage. The tenants have been given a month's notice to vacate. What is to be done with the land has not been decided.

the German Navy. While the Senators were sympathetic, they finally asked Sullivan, "How can you rectify mismanagement and misconduct in an eight-year extension which you were unable to do anything about for more than 30 years?" Sullivan had no answer, and Congress let the matter drop.

Two years later, Rood was dead, leaving virtually no estate. The loft on Dwight Street had been vacant for years, and the building was razed in 1937 to make room for a parking lot. The Rood homestead still stands on Bowdoin Street, a brooding Victorian hulk now a rooming house overlooking the city.

But it remained for that biography of shattered hopes, Scudder's Manual of Obsolete Companies, to deliver American Telegraphone's epitaph: "W.W. Millan, receiver of the above

company located at 900 F St., N.W., Washington, informed us on May 14, 1936 that by court authority sold the American Telegraphone business which he was operating as receiver, and was about to state his account and ask leave to pay the money to the court. Mr. Millan stated that he did not now have or ever did have any control over the litigation which has been pending for more than 15 years, and does not know when it will

terminate. Mr. Millan further stated that if there is anything at all for the stockholders, it will be so little as to be negligible." In a later entry, Scudder's successor, Robert D. Fisher added, "Mr. Millan died in 1937 and assets of the factory in Springfield were sold that year under court order. Assets \$55,000. On December 7, 1938, Arthur E. Elgin of Millan & Smith, 900 F St., N.W. appointed substitute receiver."

NEXT ISSUE:

How the Telegraphone Helped Solve a 1912 Murder Case; and The Sayville Story, or How Germany Set Up a Spy Station on Long Island.



Music Mountain Showcase takes over

(where American Song Festival left off).

Here's a way for songwriters & performers to win 1 of 200 recording contracts.

50 professional publishing contracts, 50 amateur publishing contracts, 50 professional recording contracts and 50 amateur recording contracts will be awarded in the Music Mountain Showcase. The Showcase competition will be held in 10 separate regions of the United States. Winners will be showcased in regional media. A record of the winners material will be produced and distributed regionally, then exposed to the entire recording industry. A recording producer evaluates each entry tape—totally—and records his evaluation on the end.

Even the losers win, because in their Entry Kit they will receive a \$2.59 blank AudioMagnetics recording tape. A \$2.00 booklet on "How to prepare a professional recording." And a pamphlet on "How to protect your art while breaking into the music business." All this alone makes the \$12 entry fee worthwhile—and if you win, you're on your way.



We added what the musician wanted.

At first we thought it was a terrific idea—the songwriter competition. But we found out. Musicians told us. Professionals and amateurs both. They said, "Sure songwriters want to break into the music business." "So do performers." But the contest should be narrower in scope—not international. They also said, "A recording contract and exposure to the 'real' industry was more important than prizes and money." Whether they won or not, they wanted to be heard. And they wanted to hear from someone in the industry. They didn't want just anyone's judgment—they wanted judgment by true professionals—then by their audience. They also wanted legal protection that a contract provides. We added all that.

Important parts & pieces.

■ Musical Showcase for songwriters and performers. Professional and amateurs. You can enter as many times as you wish in qualified categories.

■ 50 songwriter publishing contracts for professionals. 50 amateur. 50 performer recording contracts for professionals. 50 amateur.

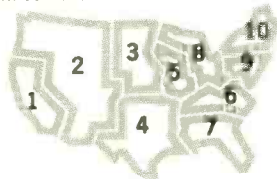
■ Competition in 10 separate regions. Awards will be given to the 5 winners in all 4 categories in each region. It's easier to win when you compete against your own peers in your own neck of the woods.

■ Judges are active recording producers with major labels.

■ Your entry will be heard—all the way through. Then returned to you with a critique.

■ You'll get a good contract. It protects you first (before you enter) and all of us if you win.

■ Your original entry will get exposure to the "real" music industry. If you win, you'll get good media exposure in your region and the entire recording industry.



- Winners' entries will be produced on albums and singles for distribution in each region. Then the public picks each regional winner by voting on their favorites.
- Winners will get free studio time to professionally record their music. Plus a Recording Institute of America course in professional recording.
- Regional winners compete in the National finals. Again the public picks the national winner. And a complete album is produced for that winner. It's all here.

Who is the Music Mountain?

Good question.

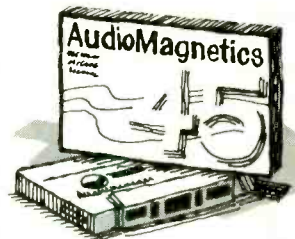
Well, American Song Festival we're not. We don't plan to spend hundreds of thousands promoting the Showcase. That's why you won't see this announcement in many places. In fact, this may be your only chance to enter.

We are a music company with a purpose. We want to bridge the gap between the art of music and the business of music. To the benefit of the artist, the audience and the industry. One of the world's largest makers of blank recording tape—AudioMagnetics—felt strongly enough about our purpose to get us started.

We're a group of serious communicative musicians—just like you. And we take our music seriously—just like you. We've all been in the Audio and Music Industry designing and selling musical products. We owe a lot to music, but must we owe it to so few? We're also tired of drama replacing true sensitivity. We want to hear you. The audience wants to hear you. And believe it or not, the industry wants to hear you. This is our way to get you heard.

Get more information today.

Simply fill out the necessary coupon below and send it in. No obligation. A complete entry kit is on its way. This kit will include a complete program brochure with an entry form. Be sure to send the coupon in as quickly as possible since the entry period for the 4 regions west of the Mississippi closes January 15, 1976. Entries for the 6 regions east of the Mississippi closes February 28, 1976.



Mail all requests to: Music Mountain Showcase
4315 Woodman Avenue, Sherman Oaks, Calif. 91423
Atten: Carolyn Ruskin

Please rush me FREE information on the Music Mountain Showcase. I understand there is no obligation.

Name _____

Address _____

City _____

State _____

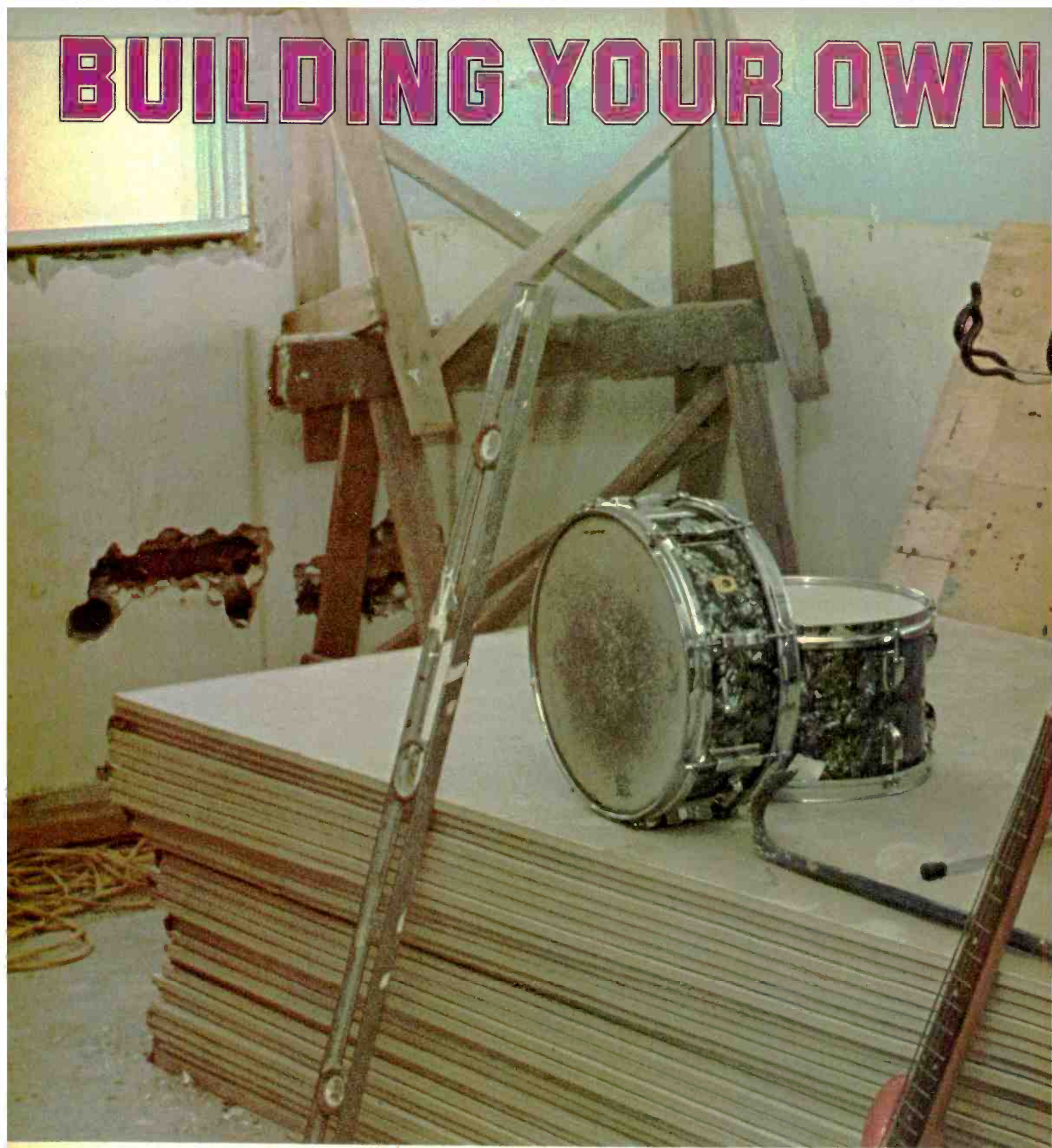
Zip _____

If you're in a hurry call (213) 872-1746

© Music Mountain Inc. 19/5

A discovery project funded by AudioMagnetics; for over a decade, one of the world's largest makers of recording tape.

BUILDING YOUR OWN



HOW ACOUSTICS AFFECT RECORDING

Room acoustics can mean the difference between good and bad recordings. They affect the sound of the music being played, the temperament of the musicians themselves (ask any musician), the sound of the eventual record-

ing and the quality of the playback.

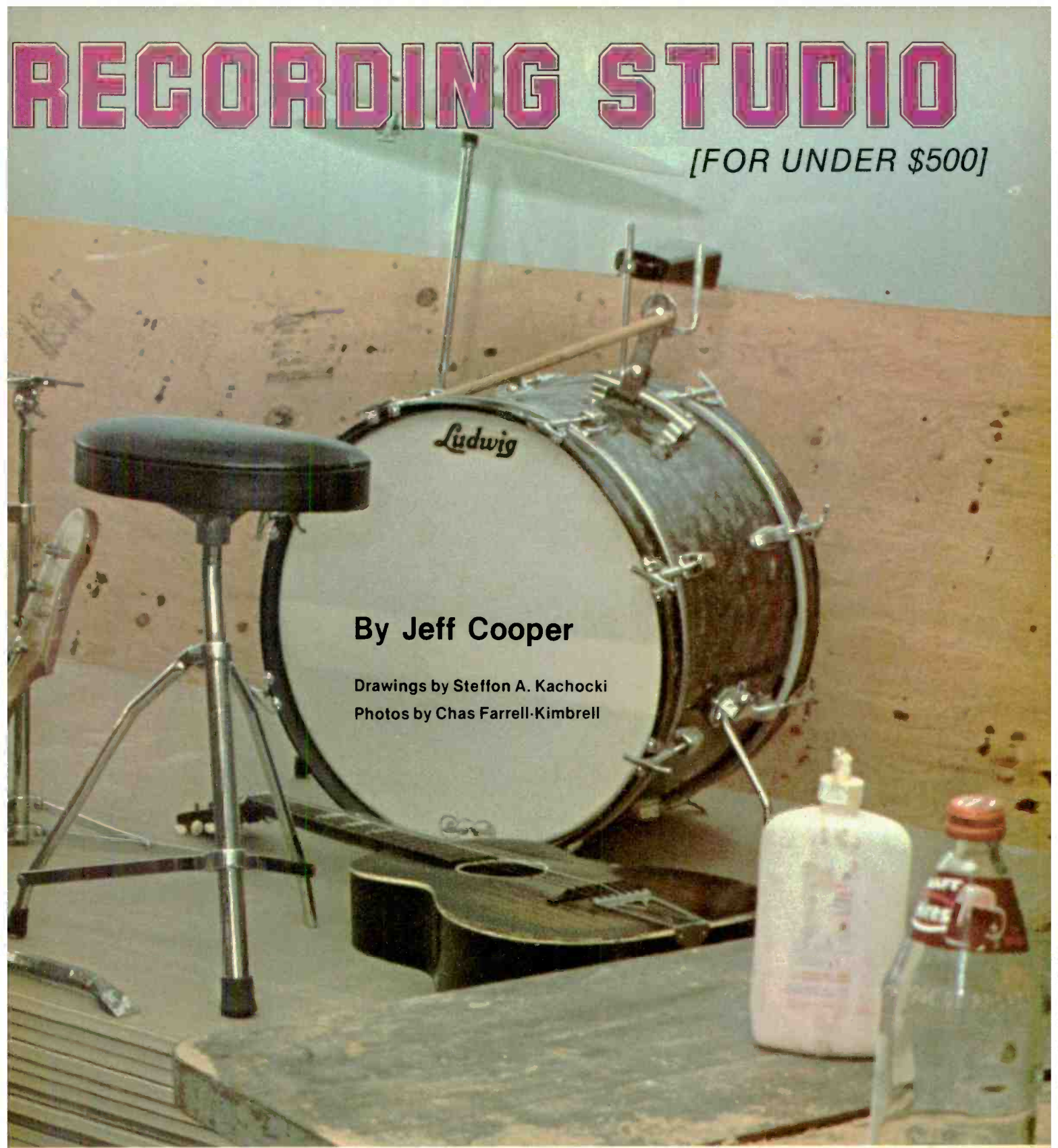
In small home studios where music is often recorded and played back in the same room, room acoustics are doubly important, because they affect both record and playback operations. For instance, if a room "colored" the natural sound of an instrument when it was recorded, the room will affect

the "colored recording" in a similar fashion during playback. This makes the original problem sound twice as bad. Similarly, if a room were too reverberant and made an instrument sound "muddy" during recording, the sound will be further muddied during playback.

To eliminate these composite prob-

RECORDING STUDIO

[FOR UNDER \$500]



By Jeff Cooper

Drawings by Steffon A. Kachocki

Photos by Chas Farrell-Kimbrell

lems, special attention must be paid to room acoustics in home studios. The musician and recording enthusiast alike must understand how room acoustics behave and how they can be used to their advantage.

Noise

Noise is unwanted sound. It is the first and most basic effect of room

acoustics on recording. If a recording environment is noisy, chances are the recording itself will be.

Noise can be produced by an infinite variety of sources (from rush hour traffic to screaming little sisters) whose only common bond is their undesirability. Noise can never be completely eliminated—for its existence is

intertwined with the very fabric of our existence. The random motion of molecular particles makes noise. Our living bodies are virtually factories of noise. In fact, our very ears must make a degree of noise in order to hear.

Despite these impediments, in a recording environment we attempt to reduce extraneous noise to its lowest

possible threshold. This process is referred to as "sound-proofing."

Reverberation

Reverberation is the gradual decay of sound in a room, after the source has ceased. It affects the character of sounds in a room and, hence, the character of any recording being made. (Compare the character of your voice in a closet with the character of your voice in a bathroom. In the closet, all of the clothing helps to *absorb* the sound of your voice. There is little reverberation. Hence your singing sounds "weak" or "dead." In a bathroom, on the other hand, there is a great deal of reverberation. The reflective surfaces of tile and porcelain *reflect* the sound of your voice back to you. These reflections reinforce your voice and make it sound powerful, or resonant and "live").

In the studio, we want to be able to control the amount of reverberation and adjust it to individual instruments and voices to suit our taste. Too much reverberation makes music too "muddy" or unintelligible. Too little reverberation makes music "dry" or lifeless.

Even if we have access to an electronic reverberation unit, we must learn how to understand and control the natural reverberation of our recording environment.

Coloration

Sometimes a room seemingly "prefers" to accommodate the reverberation of certain frequencies, as a result of its size and geometry. This results in the reinforcing and lingering of certain tones when music is played, after they should normally have ceased. This effect is called coloration. It amounts to an alteration of the natural sound.

Coloration is a result of standing waves or room resonances. These are waves whose original vibrations are continuously reinforced by their own reflections. A typical room has many standing waves and potential colorations. In the recording environment these must all be eliminated.

Echo

Echo is the repetition of a sound due to the delayed arrival of a reflected sound wave. In large rooms, we often hear distinct single echoes. In small rooms, we usually hear a short continuous stream of echoes. These latter types are called "flutter echoes." Both single and flutter echoes inter-

fere with the clarity of a recording and must be eliminated from the recording environment.

Diffusion

A sound field is diffuse if its intensity anywhere in a room is approximately equal. A room with a concave wall or a domed ceiling can never promote good diffusion. These shapes "focus" sound waves, instead of spreading them around the room. Standing waves and echoes mentioned previously are both indicators of lack of diffusion.

The diffusion of sound fields is desirable in a recording environment because it allows instruments to be recorded in different room positions with a measure of acoustical consistency. Good diffusion helps take the guesswork out of microphone placement—and makes good recordings easier to achieve.

We have discussed briefly the basic ways in which room acoustics affect recording. These are:

- (1) Noise
- (2) Reverberation
- (3) Coloration
- (4) Flutter Echo
- (5) Diffusion

Each must be controlled properly to produce a good recording environment. The methods of controlling noise are presented in the section entitled "How to Soundproof Your Room." The methods of controlling the rest are presented under "How to Achieve Good Acoustics."

HOW TO SOUNDPROOF YOUR ROOM

Noise is undesirable in a room where serious recording or listening is being done. Sometimes eliminating the extraneous noise is a simple task. Other times it is not. For instance, if the noise emanates from appliances or electric fixtures such as air conditioners and florescent lights, then the problem can be easily remedied by turning off the appliances or fixtures while recording. If the noise emanates from outside sources over which you have no control, such as traffic or wind, then you've got to invest some time and money into soundproofing your room.

Soundproofing amounts simply to "tightening" and "fortifying" the construction of your room, so that it is

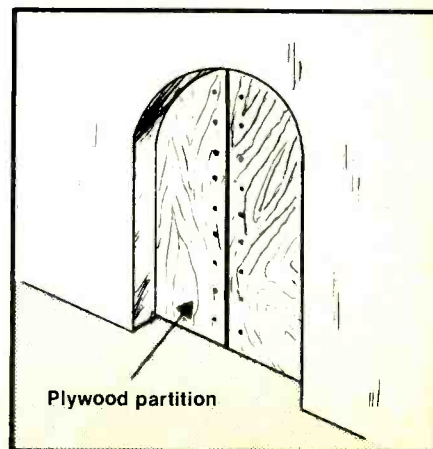
more resistant to sound entering or leaving. In soundproofing, the general maxim applies: "You get what you pay for." Nevertheless, it is still possible to do an effective soundproofing job for very little money, if some care and creativity are used.

Always remember that effort spent in soundproofing is doubly valuable, for it not only helps stop undesirable noises from *entering* your room, it also stops the sounds you are making in the studio or listening room from *transmitting* easily to nearby rooms where they would bother neighbors, roommates or parents. This means that with a little soundproofing you will be able to work in peace without being interrupted by irate people telling you to turn the volume down. So read carefully!

The best way to get a soundproof room for recording is to build a completely new airtight room within the existing structure; that is, a room whose walls and ceiling are separated by airspaces from the outside building and whose floor is "floating" on rubber or springs. For, only when the inside room is isolated physically from the outside shell, will the transfer of sound and vibration between the two structures be impeded effectively.

As one might expect, constructing such a truly isolated "floating" studio is a difficult and expensive task. In this preliminary article, we will not address ourselves to this procedure. Rather, we will concentrate on the easy-to-follow tips that can be accomplished for little or no money and for very little construction experience.

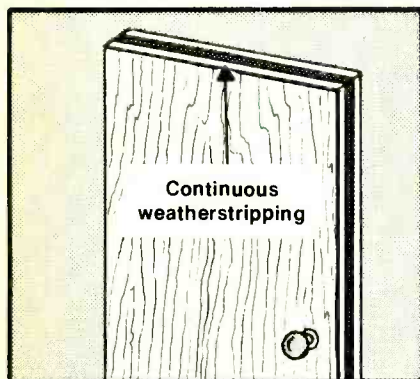
Block Any Openings in the Room— Air has a sound transmission coefficient of 1.0 (the highest possible value). Even a tiny air space such as 1 square inch can let in and let out as much sound as an entire wall. There-



fore, large openings in the studio area such as archways or doorless entrances are intolerable. They should be blocked with a tight-fitting partition of plywood, gypsum board or, if needed, a solid wooden door.

Replace Hollow Core Doors with Solid Doors—Hollow core doors are usually made with two 1/8" sheets connected to a frame. These lightweight fragile doors offer extremely little resistance to sounds. Typically, they have weight-isolation ratings of only 25 dB. A solid wood door (approximately 2" thick) has a rating of 35 dB. Used solid wood doors may be picked up very cheaply.

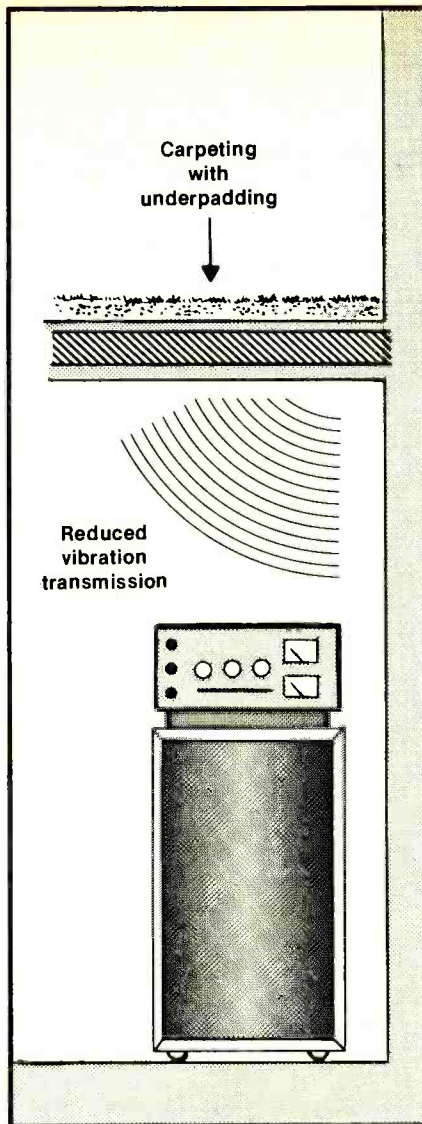
Weatherstrip All Doors—The air-space under and around doors is one of the worst culprits for letting sound in



and out of rooms. This tiny space could be letting more sound in and out than the entire wall adjacent to it. Weatherstripping, or gasketing, according to the accompanying diagram, can reduce the transmitted sound levels from 3 to 10 dB. This applies to windows too.

Put on Your Storm Windows—Storm windows are usually applied to a room to insulate it from heat loss. Yet they also help to insulate the room for sound purposes. The best type of storm window would be continuously gasketed around its edge, so that the pane can act as an independent membrane, absorbing the sound that strikes it, without transferring vibrations to the frame and hence to the room interior. As a further precaution, the space between the window panes should be lined with a sound-absorbing material such as felt or fiberglas. This helps prevent the formation of standing waves and resonance between the glass panes.

Put Carpets on the Floor . . . of the Room Above!—If your neighbor's foot-thumping is annoying you, donate a



rug or carpet to him. A well-padded carpet will help prevent the transmission of vibration and impact noise from above. A suspended ceiling in your studio would also accomplish this goal, but it's more difficult and costly to install.

This carpeting principle holds true to all rooms structurally adjacent to your recording room. However, you should always remember that the carpeting principle does not work in reverse: *do not carpet your studio in hope of reducing the amount of noise and vibration seeping in. You won't!* The only thing you will reduce is the mid- and high-frequency reverberation time—and that is not necessarily desirable.

Build "Floating" Isolation Platforms—To reduce the transmission of impact noise and vibration from noisy instruments such as drums, you must construct "floating" platforms for the culprit. A simple platform might be

constructed of 1" plywood over a 3" layer of soft foam. A more intricate platform might consist of a heavy sand-filled plywood box, approximately 8" in depth, resting on heavy-duty springs or rubber cushions.

Permanent carpets are not among the best floor surfaces in studios because they restrict the variability of room acoustics and they do not wear very durably under the hard use of musicians and heavy equipment.

Replace Light Ceiling Tiles with Heavier Ones—If your studio room has a suspended ceiling (hung from the floor above) you should be aware that most suspended ceilings are constructed with acoustical tile which is *absorbent* but not *insulative*. In other words, the tiles do not stop the majority of sound energy striking them from passing right through. They are not massive enough. To correct this, simply replace the tiles with heavier board of gypsum, plywood or fiber

A SPECIAL NOTE

Don't Add Absorption to Your Room—Adding absorption to your room is *not* the way to soundproof it. Although covering a room with carpet and acoustic tile might reduce the level of outside noise heard in the room by a few decibels (say 3 to 5 dB), it also makes the room seem acoustically "dead." A completely dead room is a terrible environment for playing music. The acoustics of the room matter too much. *Don't cover your room with acoustical tile and carpet in hopes of reducing noise transmission!* This is *not* the way to design a good-sounding studio!

board. Before doing this, check to see that the frame is sturdy enough to support the increased weight.

In addition, the air space between the ceiling and the floor above should be lined with fiberglas (made by Owen Corning). This helps to absorb sound in that space.

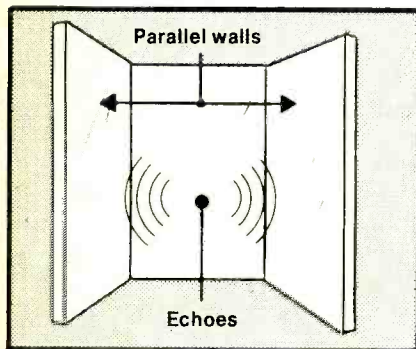
Remove Loose Objects and Small Furniture from the Room—Loose objects, such as paintings, wall hangings, sculptures, lamps and small tables, have a tendency to resonate at their natural frequency when loud music is being played. Resonances such as these produce humming and buzzing and, when picked up by a microphone, can ruin a recording.

Isolate Noisy Appliances—As mentioned above, air conditioners, heaters and other appliances can produce a phenomenal racket which may completely disrupt a good recording. If the operation of an appliance is essential to the studio (i.e., a heater in the winter which cannot be turned off for long periods of time), the optimum treatment is to acoustically isolate the offending appliance from its environment. This is done by building an enclosure for the appliance and by mounting the equipment on springs or a rubber pad to prevent its vibrations from being transferred to the room. The enclosure should be airtight, if possible, and lined with an acoustically absorbent material, like fibreglas. This treatment applies to appliances inside as well as outside the studio.

HOW TO ACHIEVE GOOD ACOUSTICS

Once the noise problem has been eliminated by soundproofing, you are well on your way to achieving good acoustics for your room. The next step is to make the room "sound good" throughout its entire volume for the playing and recording of music. This means eliminating standing waves, unnatural colorations, echoes, flutter, room resonances, focal points and "dead" spots. This also means constructing the room in such a way that its acoustics may be adjusted to suit your purposes and personal taste (i.e., made "live" for recording jazz, "dead" for rock, "flat" for the playback of tapes).

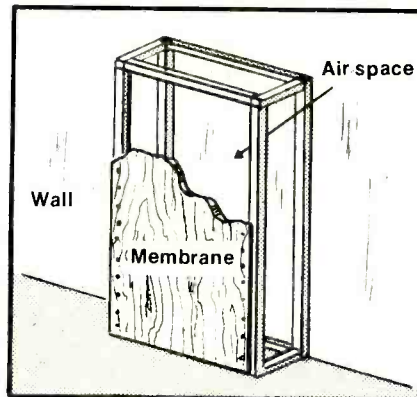
Eliminate Echoes—Echoes occur when reflective parallel surfaces in a room face each other and sound waves



bounce back and forth between them. This effect disrupts recording as well as listening. It can be eliminated by covering one or both of the offending surfaces with patches of absorptive material, such as acoustic tile or cork.

The absorption stops the sound waves from reflecting and the patching helps break up echoes and standing waves by causing the waves to diffract in random directions when they strike the patch boundaries. For this reason, patching also promotes good diffusion of sound fields.

Eliminate Colorations and Standing Waves—Absorptive patching cannot deprive standing waves of all their energy, especially in small rooms where standing waves form at audible low frequencies. To help dissipate stand-



ing waves and the colorations they produce, special low-frequency absorbers must be built. There are several types of low-frequency absorbers or "basstraps," as they are commonly called. In this article we shall discuss

the most conventional—usually referred to as "membrane absorbers" or "resonators."

These membrane absorbers consist simply of a rugged membrane of plywood or linoleum stretched over an air cavity (see diagram). They resemble boxes. Membrane absorbers work in the following way. Each membrane absorber has a fundamental frequency determined by the weight and flexibility of its membrane material and the size of its air space. When a sound wave close to this frequency (or one of its harmonics) strikes the absorber, the membrane is set into motion. This motion, in turn, sets the air cavity behind it in motion. The resistance offered by the air space, combined with the "damping" motion of the membrane itself, helps dissipate and absorb the energy of the striking wave.

The effective frequency range of a membrane absorber can be increased by lining the air-space inside with a porous absorber (fibreglas or acoustic tile). This tends to "flatten" out the absorption curve.

The following table has been designed to help you calculate at what frequency the standing waves or colorations are forming in your room. These frequencies are determined by the room's dimensions, so get out a tape measure and make a note of your room

"BASSTRAP" CONSTRUCTION

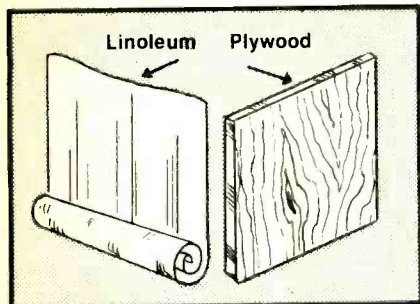
	STANDING WAVES			AIR SPACE DIMENSION		
	1st Harmonic	2nd Harmonic	3rd Harmonic	½" Plywood	¼" Plywood	1" Linoleum
5'	113 Hz	226 Hz	339 Hz	1½"	3"	¾"
10'	56 Hz	112 Hz	168 Hz	3"	6"	1½"
15'	37 Hz	74 Hz	111 Hz	4½"	9"	2¼"
20'	28 Hz	56 Hz	84 Hz	6"	12"	3"
25'	22 Hz	44 Hz	66 Hz	7½"	15"	3¾"
30'	19 Hz	38 Hz	56 Hz	9"	18"	4½"
35'	16 Hz	32 Hz	48 Hz	10½"	21"	5¼"

How to Use the Table—First locate the room dimensions (length, width and height) in the table. Now look to see which standing waves are forming along those dimensions. Next, look to see what types of membrane absorbers can be applied to the walls or ceiling to help eliminate these standing waves. Several alternatives for membrane absorbers are given (using 1", ½" or ¼" plywood). If your room dimensions fall between two of the table values (as they probably will), simply approximate the air space accordingly.

dimensions (length, width and height). If the room has divisions or alcoves, make a note of their dimensions as well. Standing waves can easily form in these areas too.

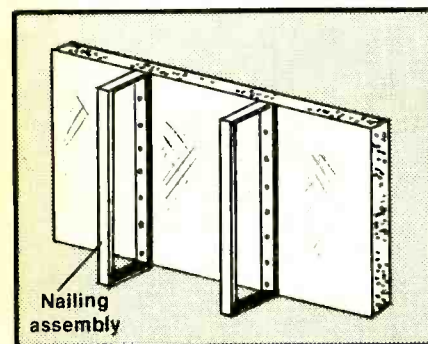
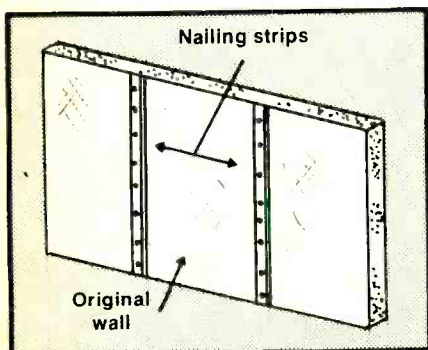
The method for constructing and installing "basstraps" is as follows:

(1) Determine the type of membrane you will be using (plywood, paneling or linoleum), and check the



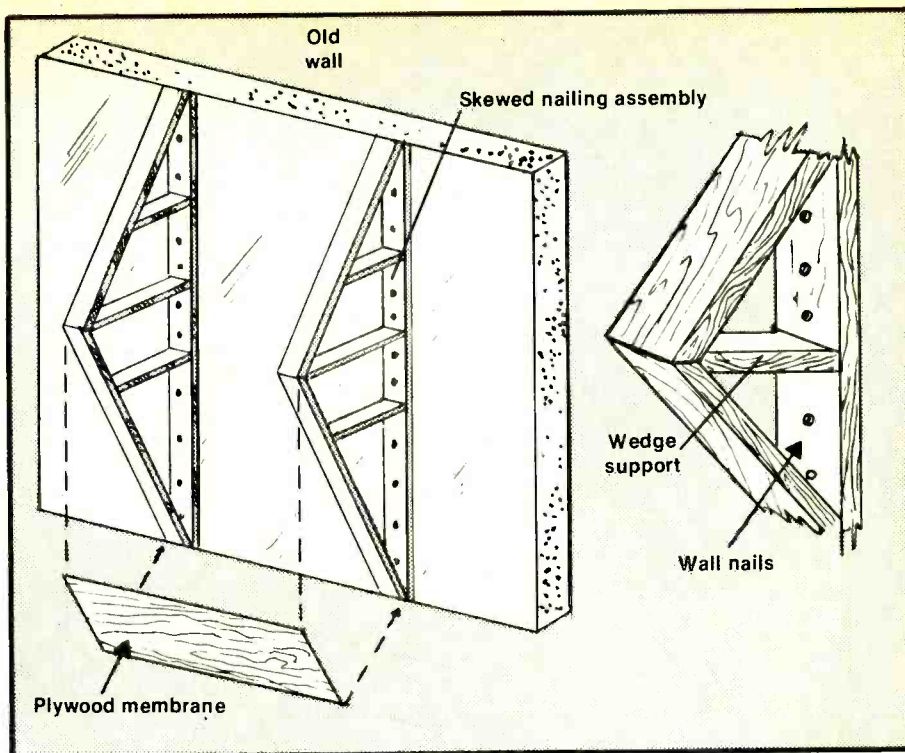
required air space for your particular room in the preceding table. Do this for both dimensions of your room (length and width).

(2) Apply nailing strips (or nailing assemblies) of the same dimension as



the required air space to your existing wall. (This can be your original wall or the secondary, sound-insulating wall you built to soundproof your room.) The strips should be spaced apart at whatever dimension your membrane material comes in (usually 4').

If you are using a thick, heavy membrane (1" plywood), the required air



space will probably be small (under 4")—and you will be able to use single studs of wood (such as "2 x 4's") for nailing strips. If your required air space is larger, you will have to construct a "nailing-block assembly" (made of several studs). Both of these are pictured.

To broaden the frequency range over which the basstrap is effective, the nailing assembly can be "skewed" to create a multi-dimensional air space. This is also pictured.

This latter type of assembly serves three purposes:

(a) It absorbs low-frequency energy over a broad spectrum.

(b) It helps "break up" standing waves, echoes and flutter by presenting an irregular surface to the sound field.

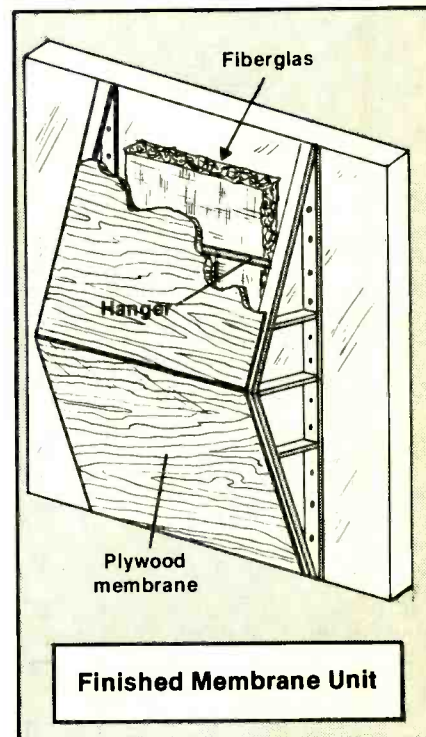
(c) It helps promote the diffusion (even distribution) of sound fields in the studio.

This skewed type of basstrap eliminates the need for calculating an exact air space dimension and acts simply as a broad-band low-frequency absorber.

(3) Line the air space with fibreglas, acoustic tile or an absorbent blanket. This, also, broadens the effective frequency range of the basstrap—as well as helping to prevent audible resonances inside the air space. This effect is illustrated.

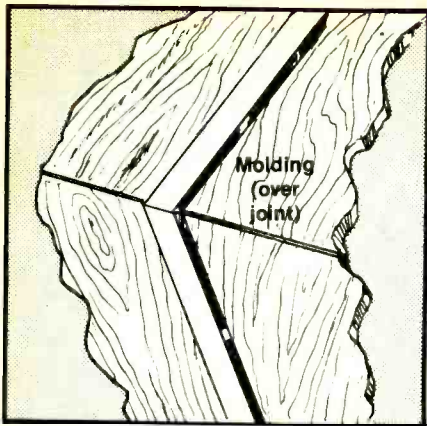
(4) Apply the membrane of plywood to the nailing assembly by means of direct nailing, screws, glue or

through the use of resilient hangers. The latter method will help the membrane to act as a sound "isolator" (i.e., it will help prevent sound from entering or leaving the studio.

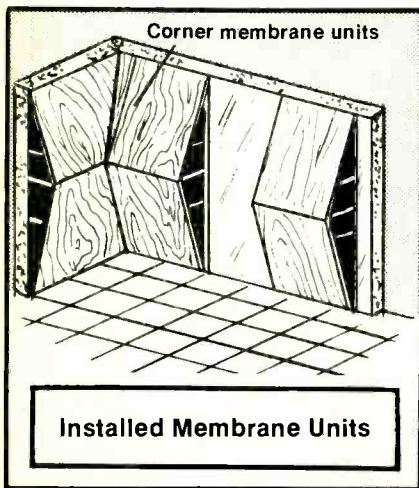


(5) Seal any air spaces between the panels with calking or cover the air spaces with molding.

The surface area that the basstraps must cover in your studio will depend on many factors, including the size of your studio, the severity of its stand-



ing waves, the effectiveness of your basstraps, etc. Usually, the area will vary between 25% and 75% of the wall area in the room. As a rule of thumb, if $\frac{2}{3}$ to $\frac{1}{2}$ of your wall area is treated with resonators of the proper dimension,



concentrated especially at corners and on opposing, parallel walls, your studio will be reasonably safe from severe standing waves.

In general, smaller studios (under 150 sq. ft.) will require slightly larger percentages of low frequency absorption. Larger studios will need less. (Smaller rooms have dimensions which encourage more severe standing waves.)

Build Portable Isolators or Gobos—

If you are doing multi-track recording (recordings in which individual instruments are assigned to individual tracks of the tape), then the musical instruments must be acoustically isolated to prevent the sound of one from "spilling over" to the microphone of another. This goal is accomplished by two basic methods:

(1) Miking each instrument at close range with special, uni-directional microphones which reject extraneous noise.

(2) Enclosing each instrument with several portable sound isolators or "gobos." These panels form makeshift "rooms" around the individual instruments and help to locally isolate their sound waves.

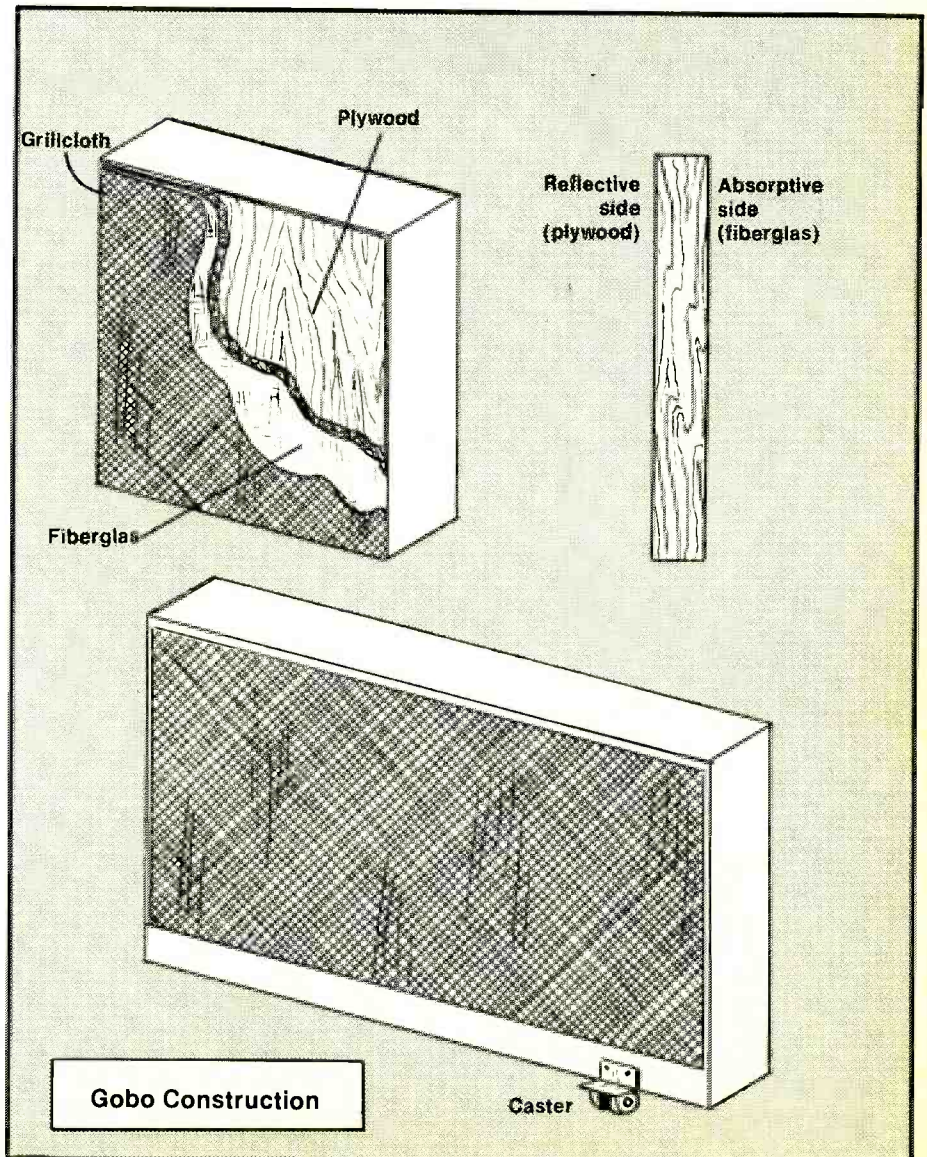
To be effectively sound retardative, gobos must be reasonably heavy. This heaviness can be accomplished by constructing the gobo from plywood, particle board or masonite. Several sheets of these materials, applied in a sandwich construction, would be most effective; but single sheets, properly installed, can do the job adequately. Remember that a gobo constructed simply from fiberglas or blankets, stuffed into a frame, will *not* be nearly as effective as a solid gobo.

The outer surfaces of the gobos should be treated with absorbent material such as fiberglas. This helps stop impinging sound waves from be-

ing reflected out into the studio (as well as back into the studio where they might cause acoustic phase cancellation).

This type of absorbent surfacing gives the instrument being recorded a rather "dry" or isolated sound. Sometimes, this is desirable—especially, if effects such as reverberation or echo will be added to the instrument during mixdown. If, however, a more live "room" sound is desired, treat only *one* side of the sound baffle with fiberglas—leave the other side bare so that the plywood offers a sound reflective surface. The plywood, itself, can be painted or stained so that it looks attractive. This type of gobo can then be turned around during the recording session to give you the kind of sound you feel is most appropriate.

There are many satisfactory designs for gobos. One that has proven



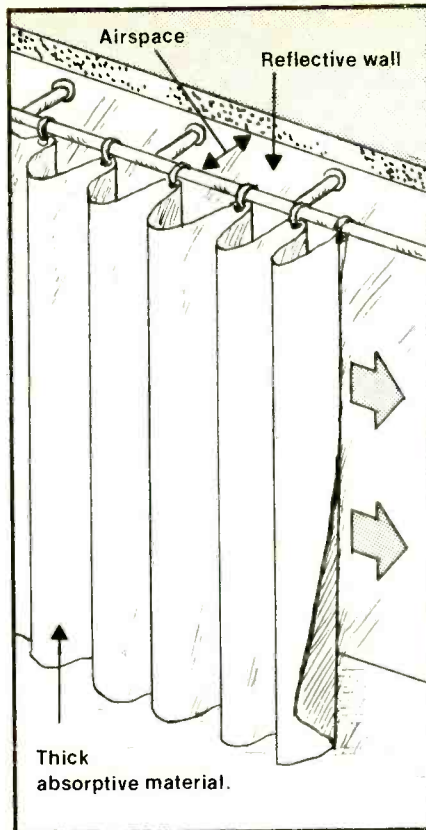
both effective and easy to build is shown in the accompanying diagram.

This type of sound baffle is easily moved by one person. It can be made even more portable, however, if castors or rolling wheels are installed on the base. Unfortunately, this can create an undesirable air space underneath the gobo, which can leak tremendous amounts of sound. This problem can be solved by lining the bottom edge of the gobo with a continuous double "skirt," made from strips of rubber or old carpeting. This is pictured in the accompanying diagram.

Hang Up a Thick Curtain—One inexpensive way to adjust the acoustics of your studio is to utilize a thick, sound-absorbing curtain. When the curtain is drawn, it will "soak up" sound waves (mostly high frequency waves), thus creating a "dead" room with a very short reverberation time. This helps control the amount of reflected waves, traveling around the studio, thus diminishing "leakage" (i.e., the leaking of sound from one instrument into the mic of another instrument).

When the curtain is left undrawn so that the reflective wall behind it (plaster, wood paneling, plywood, concrete or brick) is open to the studio, a much more "live" sound can be achieved. This applies to all instruments being recorded, including electric and acoustic guitars, saxophones, horns and drums, as well as voices.

To be effective, the curtain should be very thick—the thicker the better—and made from a sound-absorbing material such as velour or flannel. Light chiffon or gauze curtains or



bamboo curtains will not absorb any sound.

If an air space of several inches is left between the curtain and the wall behind it, better low frequency absorption will result. This occurs because the curtain tends to act like a membrane absorber.

This article by Jeff Cooper was excerpted from his new book entitled How to Build Your Own Recording Studio, which will be published by Tab Books in early 1976. —Ed.



Crown The Known Value...

at an uninflated price!

An honest value isn't hard to find, if you know an honest supplier. CROWN's reputation for providing more recorder value for your dollar is as old as our company. Nothing would ever cause us to change that.

CROWN recorders offer you day-in, day-out worry-free reliability, plus brilliant performance. Both result from simple, rugged design, with only a few moving parts. The CROWN belt drive and massive flywheel almost completely isolate the capstan drive from any vibration or rumble.

CROWN electronic circuits are carefully designed for maximum reliability, and electronic components are thoroughly tested before assembly. Oversize meters and easy-to-handle-controls make operation simple. The result? A professional tape deck, used to produce quality recordings in many a studio.

Each CROWN transport has undergone 100 hours of testing. Each CROWN recorder has its own performance report, signed, not stamped, by a CROWN inspector. And each CROWN recorder is backed by a one-year full warranty on parts and labor; and an additional two-year limited warranty on parts only. We put the CROWN name on these recorders proudly — we believe they've earned it.

Why not talk to your nearby CROWN dealer about the long-term values of a CROWN recorder. And the uninflated price. It could be the year's best buy.

Write us for his name. CROWN, Box 1000, Elkhart, IN 46514



CROWN

WHEN LISTENING BECOMES AN ART
CIRCLE 11 ON READER SERVICE CARD

A SESSION WITH STEEVIE



WONDER

By Gene Charles
and Bob Weil
Photographs by Matthew Cupp

Friday,
August 22,
9 P.M.

The handwritten sign taped to the glass door of Crystal Studios reads: CLOSED SESSION! THANK YOU! Not surprising. Most recording artists consider the studio a private sanctuary where they can create, experiment and even make an occasional mistake. Extraneous observers are distracting and can inhibit the studio performance and interaction.

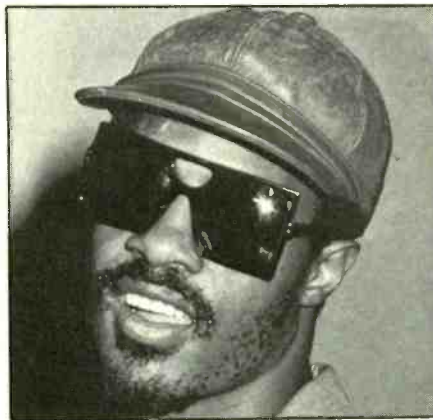
Ira Tucker, Stevie Wonder's p.r. man, has left word at the studio so we are admitted to the "closed session." The usual crew of friends and associates are rapping in the hallway, but we know that we'll leave that commotion behind when we enter the control room. Wrong!

Twelve assorted friends and guests, nine members of a local T.V. station's film crew, four musicians, three engineers, two roadies and a partridge in a pear tree fill the control room. But no Stevie Wonder.

Tonight's session was scheduled for 9:00. By 10:30, those of us who are not used to Wonder's unpredictable schedule are getting fidgety. Suddenly, second engineer David Henson's voice announces, "Ladies and gentlemen, welcome to the Steveland Morris Show," as Stevie Wonder (née Steve-

land Morris) enters with Ira and Josette Valentino, his friend and aide. The mood of the control room immediately lifts as we are all Wonderized.

Stevie gets right down to the business at hand as his personal engineer, Gary Olazabal, places his hands on the musician's outstretched palms. A little game of speed and reaction to loosen up. Stevie proves too quick for Olazabal tonight and kids his buddy about it: "Listen, honky, get your act together before you try me again. Let's take a listen to 'Sing a Song.'"



John Fischbach, co-engineer for the session with Olazabal, starts up the 16-track Studer A-80. A blend of steel drums, vibes and harp fills the room.

Wrong again!

The sound we're listening to is Stevie playing one instrument—a modest \$50,000 Yamaha polyphonic synthesizer which looks more like an organ than a synthesizer and sounds like anything it's programmed to sound like. Stevie has nicknamed the Yamaha "The Dream Machine," and he relies on Fischbach to do the complex programming—a time-consuming assignment that takes a keen ear and a talent for breaking down the desired sound into the fundamental parameters that will simulate that sound.

"Sing a Song" had been recorded the night before at 6 a.m., and it sounds even better after a good day's

sleep. Ewart Abner, President of Motown Records, enters just as it's fading out; Stevie greets him warmly and asks John to run it through, again.

Sing your song
Sing your favorite song
The one the D.J. used to play
All night long . . .

It's a happy tune—an uptempo relative of "Heaven Is Ten Zillion Light Years Away" from *Fulfillingness' First Finale*. The song epitomizes Wonder's love for music and life, and Abner really gets off on it. . .

FAST FORWARD

Friday,
September 5

Ewart Abner resigns as president of Motown Records and is replaced by Berry Gordy. "Sing a Song" has been bumped from the album and is replaced by "You're My Baby."

REWIND

Friday,
August 22,
11:30 P.M.

. . . Abner really gets off on it. "Sing a Song" is surefire gold if the control room vibes are any indication.

We listen to some of the rough mixes that Wonder has on his ever-pres-

© 1975 Black Bull Music Inc./Jobete Music Co. Inc.
All rights reserved, reprinted by permission.

ent cassette library, and from the smile on Abner's face and the tapping of his feet, it's clear that he feels really good about the man that his company just signed to a seven-year, \$13 million contract.

Channel 2 News in Los Angeles is running a week-long special report on superstars Elton John and Stevie Wonder. The audio man is notified that the interview will take place in the control room where Mr. Wonder mixes.

"What's there to mix? He's only one man," he replies.

Uh-oh! Well, at least now we know what kind of an interview to expect . . . and we are not disappointed.

(LIGHTS, CAMERA, ACTION)

Lady Newscaster: "How does it feel to be a Superstar? How does it feel to have \$13 million?"

Stevie Wonder: "Well, uh, I can't really relate to that."

Lady Newscaster: "What are 16-tracks? What brand recorder is that?"

John Fischbach (in the background): "Oh, that? That's a Datsun." (Laughter from all but the news crew.)

Wonder is being polite and trying to answer the questions seriously. This is no mean feat with the Fischbach-Olazabal Barely Audible Comedy Show cracking up the rest of the studio.

The interview does prove to be informative on a couple of counts in spite of itself: we learn that the new double album will be entitled *Songs in the Key of Life*, and we realize that the media's coverage of "Stevie Wonder, Superstar" has made those people skeptical of any genuine interest in "Stevie Wonder, Creative Artist."

It's after midnight and Fischbach is ready to get to work. The news people



have departed, and Stevie is sitting down at the Wurlitzer electric piano to do overdubs on "Ebony Eyes," a song he started more than half a year ago at the Record Plant.

Most artists try to maintain a tentative schedule in the studio in order to lend continuity to the sessions and to enable the artist to record as efficiently as possible. This means less money spent on studio time, and more time for other pursuits.

But Stevie Wonder is not "most artists." He lives a spontaneous existence and the continuity of his sessions is more emotional than chronological. He is financially able to ignore studio expenses, and music and recording are his life.

Stevie's warm-up doodling on the Wurlitzer gradually evolves into an unfamiliar riff. It's definitely not the ragtime part planned for "Ebony Eyes," and Olazabal panics: "Somebody stop that boy before he writes another song."

Too late! Stevie calls out, "Run the

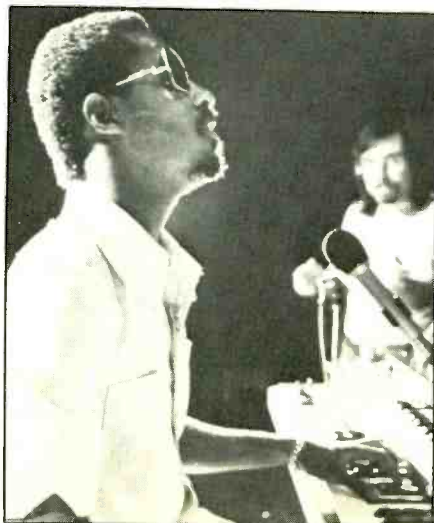
2-track," but Fischbach is ready: "We know, Steve, it's already going." The 2-track will be Stevie's reference version which he can return to periodically to retain the song's original feel.

Wonder tries a couple of different rhythms for the new song, "In the Business." As he plays, he scatsings, throwing in some tentative words here and there. When he's done, he says, "Yeah! We'll record that one tomorrow. On second thought, get out a 16-track. Let's do it now."

Stevie lays down the piano and vocal tracks and, after punching in a few minor modifications, he's ready to hear it back.

The birth of a song is an exciting thing and, as Olazabal says, "A song has to hit you the first time or it never will, and it will never hit you the same way again. The first time is your inspiration point. After that, it starts to become a record."

"Yeah, I'd like to share the demo of 'Heaven Is Ten Zillion Light Years Away' with you all," says Stevie en-



thusiastically. "The tune didn't quite get the feeling it could have on the album. I've even thought of recording it again, but we don't like to do that. You'll agree that the feel was really there, even though I wasn't singing words. The words I did write were close enough to the feel of the original vocal that it shouldn't have lost that much. Sometimes, words do change the way I sing, and we're spending a lot of time on 'Lady Prima' for that reason. Another thing that really affects the feel of a song is the key I play it in. 'You Haven't Done Notin', 'Superstition' and 'In the Business' are all in E-flat, the key of Taurus [Stevie's sign]. E-flat is my best key for this kind of funky tune."

Pleased with the piano track, Wonder's ready to lay down a bass track. Charlie Brewer, his technician, sets up the ARP 2600 in the control room because it's being recorded direct. Heavy bottom! We feel it in our chests as the bass fills the room. The synthesizer bass sound is reminiscent of 'Boogie on Reggae Woman,' but less prominent. When Stevie plays a

part that he feels could be better, he asks Fischbach to rewind so he can try it again. He plays along with the track and, at the proper instant, cues the engineer to punch him in. These cues are sudden nods of his head or flicks of his hand, and Olazabal and Fischbach are right on top of them. Most musicians will retake a whole part or punch in at a tacit, but Wonder and his engineers have a rapport that enables them to punch in virtually anywhere in the track. And they certainly make good use of it.

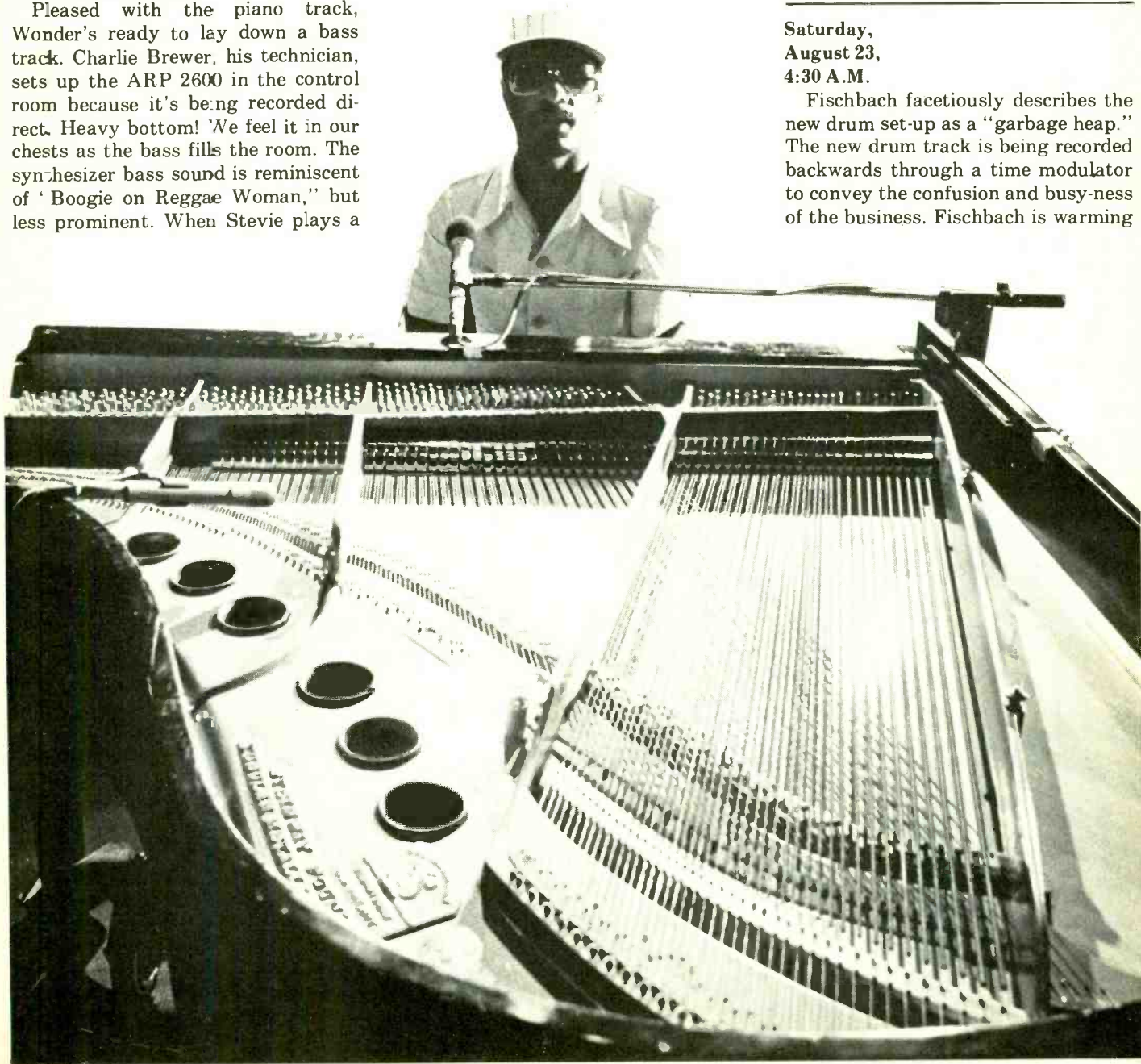
Next comes the drum track. "We don't have any one method of setting up the drums or mixing them, except

we like to position drums and piano as the musician hears them," Fischbach says. "We just try for whatever is going to sound right for the cut." The set-up for "In the Business" is pretty straightforward: Sony C-500's on the ride and crash cymbals; a Neumann 84 on the hi-hat; a Shure mic run through a limiter and a Kepex noise-gate for the snare drums; and Neumann 87's on the tom-toms. The bass drum set-up is a little unusual. Fischbach has put a 4-inch speaker hooked up to a transformer on the bass drum. It has become a microphone with a wide diameter, and it picks up a lot of low-end resonance.

FAST FORWARD

Saturday,
August 23,
4:30 A.M.

Fischbach facetiously describes the new drum set-up as a "garbage heap." The new drum track is being recorded backwards through a time modulator to convey the confusion and busy-ness of the business. Fischbach is warming



up: "Boy, do we use effects—and any way we can get them! There's nothing straight on this song. Even to the point of using a slap echo on the tamborine, with me turning the channel on and off to get the proper number of beats, because we couldn't get people to clap in unison. So, we'll use whatever's at hand. We do a lot of experimenting, and we spend an abnormal amount of time because of it. Sometimes people laugh at us for that. Anyway, 'In the Business' is all effects and that's making it very difficult to put a vocal on it."

FAST FORWARD

**Wednesday,
September 17,
10:15 P.M.**

"Carole and Mary, let's go." Wonder has just finished running down lyrics to "In The Business" for his back-up vocalists, Carole King and Mary Whitney. Mary is one of the three female vocalists in Wonderlove, Stevie's back-up band on the road, and Carole needs no introduction. The two ladies join Stevie at the piano, and he leads them through the desired phrasings. He has decided to record the background vocals using the work vocal as a reference. His lead vocal won't be recorded until the following night. He's not exactly "going by the books," but he knows what he wants.

Is it true that everything goes
In the business?
Going lower than below
In the business?

Stevie, Carole and Mary are boogeying around the mic, clapping their hands. The energy level is high and they are loose.

Do you have to sell your soul
For the business?

Carole King: "Yeah, you do, but with a little luck you get to buy it back."

John Fischbach (in the control room): "Carole's one of the few people who's had the maturity to cope with the business."

Can you make it coasting along
In the business?

Doing so me right, but plenty
wrong

Is that business?



Stevie asks to hear the chorus back and Carole peers through the double window into the control room, confirming our suspicions: "My God, Steve, I've never seen so many people in a control room in all my life." She is enjoying herself and seems comfortable working with John at Crystal again.

REEL CHANGE

Fischbach produced Carole's debut solo album, *Writer*, at Andrew Berliner's Crystal Studios, on the recommendation of his friend and fellow engineer, Chris Huston. "Doing that album," John remembers, "brought me to the terrible realization that I had no idea what I was doing, so I thought I ought to find out. I just stayed here, and about three or four months later, I bought in and became partners with Andrew. We started off doing almost 100% Motown sessions. Then Richard Perry came in to do some Ringo tracks, and so on. The money that has come in from clients has gone back into the studio so we can have the best equipment we could make or buy."

Fischbach and Berliner put their own console and monitors together because they knew what they wanted. The console is 24-in, 16-out, and it's built to be dependable. Equipment malfunctions that result in down-time are intolerable to John and he can't remember calling a session in the five years he's been there. One of the console's unique features is the "3-D" function. This combination of filters gives the engineer the ability to give each track an appearance of depth in addition to the right-left positioning.

The monitors are JBL components with a custom crossover network. They are clean and flat and John likes to crank them to hear a higher proportion of direct-to-reflected sound. The big monitors are backed up by a pair of Orotones which give a good idea of what the mix will sound like on the average home system. Crystal also has a small AM transmitter that enables them to hear mono mixes on a car radio in the parking lot.

The studio has four Studer tape machines: a 24, a 16 and two 2-tracks. John says that although the Studers are expensive their dependability and superior recording quality make them worth it. Their Nakamichi cassette deck is used to make cassettes of each session's product for Stevie.



Engineer John Fischbach programming the Yamaha synthesizer prior to Stevie's session.

John first met Stevie in '71 through Bob Margouleff. Stevie had observed a session that Margouleff engineered with Malcolm Cecil and was impressed enough to ask Bob and Malcolm to engineer his next album, *Music of My Mind*. Bob checked out John's studio in Los Angeles and liked it, so they set up Tonto—their huge custom synthesizer—at Crystal and made it their home base.

John Fischbach: "They recorded something like 40 tracks here [some of the tracks appear on the lp, *Talking Book*], but we were too poor to fulfill certain desires of theirs, so they went to the Record Plant. That was the last I saw of Stevie until November of this year when he called and asked if I'd like to work with him."

Gary Olazabal: "After the split with Margouleff and Cecil, Stevie was upset that they didn't give him information on some of the tapes he had recorded. I was a staff engineer at the Record Plant recording everyone from Dave Mason to Zappa, and I worked with Steve on *Fulfillingness*. I went independent and he asked me to go with him and it's been a full-time gig. We've recorded at the Record Plant, Motown, Electric Lady and the Hit Factory in New York, and then Stevie

decided to go back to Crystal to get a different sound."

John Fischbach: "And we've been doing it here ever since. Just about every day except for three months in New York working with Steve and Gary O. at Media Sound and Broadway. Since we've been back, it's all been here except for a few piano tracks at the Record Plant."

Crystal is not the most luxurious, futuristic studio in Hollywood. Fischbach and Berliner would rather sink their money into the best and most innovative equipment available than into a sauna or plush decor. Stevie Wonder certainly has his choice of recording studios, and he has made Crystal his base. He shares their curiosity in the newest devices and techniques, he likes the sound and, just as importantly, he likes the people.

Stevie Wonder: "Through all the changes, Crystal gives me a certain amount of the stability and security that I need to be able to create."

John Fischbach: "It's really a pleasure working with Steve. It's very demanding and sometimes frustrating, but it's worth it. He appreciates what we are doing and allows us room to create so that we know what we're doing is valuable."

REWIND

Saturday,
August 23,
1:00 A.M.

Stevie Wonder: (over the control room monitors):

♪ The only place I feel at home
I'll take a bus or a train

Gary Olazabal: "This is supposed to be instrumental. Stop him, he's writing another song!"

John Fischbach: "Too late, run the 2-track."

Stevie has asked John and Gary to help him finish the album by keeping him away from keyboards where he'll invariably write another song. When an album is nearing completion, Stevie's concept of the album gets clearer and he starts writing songs that fit in. There are already 400 songs in the can that he's written since the completion of *Fulfillingness*.

Michael Symbella, guitarist for Wonderlove, arrives ready to overdub the guitar part for "Contusion," a jazz-rock instrumental reminiscent of Jeff Beck's "Blow by Blow." Symbella is hot and puts down a sizzling guitar part over the tracks recorded more than a week ago by Stevie and the Wonderlove rhythm section (Raymond Pounds on drums and Nathan Watts on bass). Stevie has assumed the roll of producer, conveying subtle phrase changes to Michael and cueing Olazabal on the punch line.

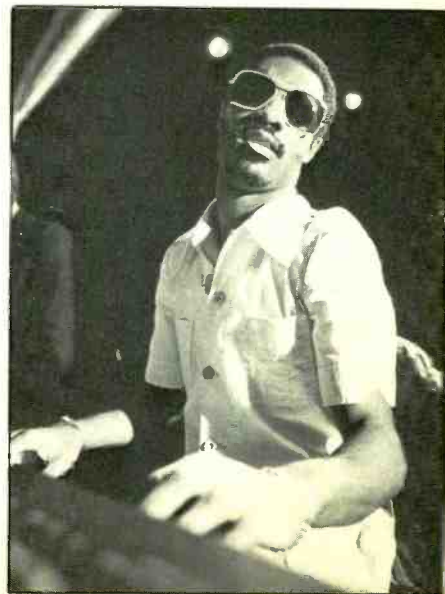
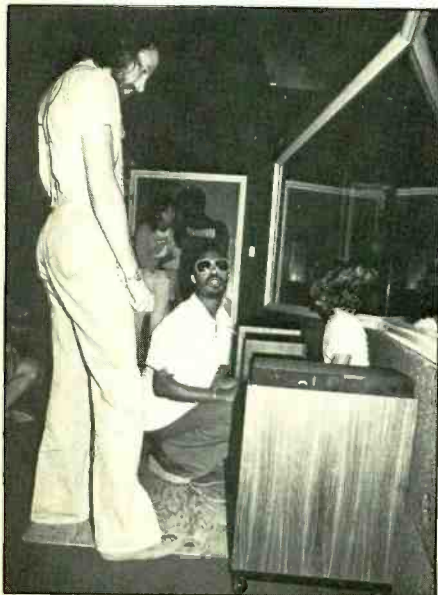
The addition of the guitar part leaves "Contusion" one track away from completion. Another Wonderlove member, Greg Phillinganes, sits down at the Oberheim Four-Voice Polyphonic



Synthesizer's prototype and runs through "Contusion's" rapid-fire riff a few times. Wonderlove has been playing "Contusion" on the road for year and a half now and the 19-year-old's fingers are flying.

Technician Charlie Brewer gradually varies the setting on each of the synthesizer's four modules until he achieves the sound and effect Stevie wants. The Oberheim is the only stereo synthesizer on the market, and Stevie is delighted with the added dimension. The instrument is polyphonic in that four sounds can be produced simultaneously. Most ARP's and Moogs are able to produce only one sound at a time, although some can be modified to produce two.

The Oberheim consists of four synthesizer expander modules, each of which contains the circuitry for a complete synthesizer: voltage-controlled oscillators produce the pitch; voltage-controlled filters vary the overtone structure or timbre; a voltage-controlled amplifier oversees the level; and an envelope generator varies the three characteristics that determine the shape of the sound—attack, sustain and decay. The modules are connected to the keyboard by complex circuitry that senses which key has been played and assigns it to a module according to one of a number of pre-set patterns. Four voices allow Phillinganes to play chords and contrapuntal lines that would be impossible on a



conventional synthesizer. With four more units on order, Stevie will soon have an eight-voice model.

Second engineer David Henson presses the record button and Philinganes is off to the races. He is basically doubling Sybelle's guitar part and the control room bursts into applause at the end of the song.

FAST FORWARD

Thursday,
August 28,
Midnight

Olazabal has "Ebony Eyes" set up to do some overdubs, but in true Wonder fashion, Stevie decides to mix "Contusion." A couple of run-throughs establish the positioning, a little re-EQ, and they are ready to go.

"Okay, 'Contusion,' Slate #1." Fischbach is constantly making minor adjustments and bringing the tracks in and out as they solo. "Contusion" starts to sound a little busy towards the end, so Gary dumps the guitar and synthesizer tracks. A brief silence at the conclusion is broken by the sound of Stevie, John and Gary giving each other skin. The producer/engineer's dream: the one-take mix.

Stevie Wonder, producer, tries to disassociate himself from Stevie Wonder, musician and songwriter. Whether he's producing himself, Minnie Riperton or Wonderlove, he has an uncanny sense of what is happening on each track and seems to hear what else the song needs. His albums *Music of My Mind* and *Innervisions* take on added meaning after observing Stevie Wonder in the studio.



It is midnight and the control room that had been surprisingly empty at the start of "Contusion" is packed again. But Stevie and the engineers don't seem to mind the crowd. It's time to get back to the original plan for the evening—some overdubs on "Ebony Eyes." Sneaky Pete Kleinow of the Flying Burrito Brothers sits down at the pedal steel guitar and runs through the 4/4 song. The pedal steel is being recorded direct so he is playing in the control room where he can communicate better with Wonder, Fischbach and Olazabal. Pete asks Stevie if he has anything specific in mind and Wonder tells him to put down what he feels. The staccato steel guitar goes well with the honky-tonk piano and Stevie decides that he wants another pedal track, too.

Technician Brewer patches the guitar through a fuzz box and an Oberheim Mutron B phaser that will "dirty up the track a little." Sneaky Pete is fascinated by the new sound he's getting on the track and Stevie is eager to try the Sonovox on it.

The Sonovox is a driver that is put up to the neck and vibrates the vocal box. The "vocalist" merely forms the words with his mouth and the pre-recorded signal is verbalized.

She's a sunflower of nature's
seed

A girl that some men only find
In their dreams. When she
smiles



It seems to light up the stars.
They glow one by one
Then start to light up the sky.
She's a devastating beauty
A pretty girl with ebony eyes.



It's strange to hear a distorted pedal steel guitar sing with Stevie Wonder's intonations, but it works. When the guitar part is combined with the time-modulated vocal track, the cabaret atmosphere of the song is even more emphasized.

FAST FORWARD

Thursday,
September 4,
2:30 A.M.

The vocal tracks will be the main concern in mixing "Ebony Eyes." There are several vocals and Stevie wants to make sure they complement each other without blending too much. One of the characteristics of Stevie Wonder's music is his ability to position sounds so that they weave in and out without masking each other.

"John, bring up the right background vocal."

"Brighten up the crash cymbal."

"The piano needs more midrange."

"Let's try panning the vocals except during the sax solo."

The engineers are quick to comply, but they don't hesitate to let Stevie know if they hear it differently. Stevie is a perfectionist, but he also places a premium on spontaneity. The fact that he can satisfy both of these ambitions is a tribute to his creativity and to John and Gary's engineering.

"Let's take it. 'Ebony Eyes,' Slate #1." John and Gary are riding the faders and panning the vocals throughout the track. Four hands seem inadequate but the take is good.

The tubular effect on the other processed vocal was achieved with a Marshall Time Modulator. Steve St. Croix of Marshall Electronics was flown in from Maryland with the prototype of the unit that is making its public debut on *Songs in the Key of Life*.

The modulator changes the time base of a signal with a sweepable delay line. This analog unit (other delay lines are digital) can produce effects including artificial double-tracking by programming variable pitch and timing errors, voltage-controlled flanging and phasing, and Doppler frequency shift. This pitch change is remarkable in that harmonic proportions, and therefore timbre, are maintained.

On one of the drum tracks on "In the Business," the drum signal itself controls the amount of delay. This gives a flanging effect that is fed back into itself. The result is that Wonder

can drive the drums up to any desired tone simply by varying the force of his playing.

St. Croix is impressed: "Stevie's never touched the modulator before and he's already got it doing what he wants. That's the way it should be used. He must hear what he wants to happen before it happens, and he must feel what effect it will have on the song and listener." Stevie and the engineers are equally impressed, and it's unfortunate that St. Croix is on too tight a schedule for them to explore other possibilities.

Stevie asks for more sock cymbal the next run and it's almost there, but not quite. "Slate #3."

John and Gary are smoother this time, and it is quickly apparent that this will be a take. The two engineers work well together and anticipate each other's moves without a word. They have been working with Wonder for the past nine months and it shows. Like the rest of Stevie's studio family—Josette, Charlie, Looch, Calvin and John—things get done by coordinated efforts more than by individual assignments.

Stevie exclaims, "Whew! Let's hear it back."

Gary sits back and immerses himself in the mix while John relaxes and taps his foot. Meanwhile, Stevie is bouncing in his chair, his head bobbing, with an occasional pause to concentrate on a specific passage. The finale is followed by Stevie whispering, "Please buy my record," and the control room loves it.

"Great panning, Brother John. Ladies and gentlemen, let's hear it for Mr. John Fischbach on the pan pots." Stevie is psyched and laughs as John takes a bow before going on to the next song.

FAST FORWARD

**Wednesday,
September 10,
11 P.M.**

Wonder is redoing the vocal track to "Village Ghetto Land," an unusual song with heavy lyrics set to light classical chamber music. Stevie feels that his original vocal sounds young so he is trying different phrasings and adding more bottom to the vocal.

"Your dream's come true, Stevie. For once you can wag your head 'til it falls off." Fischbach is jiving Won-

der about his constant head movement that has presented problems with recording vocals from time to time. At the moment, though, they are using an unusual double mic set-up and the head bobbing gives a feeling of movement to our tour of the ghetto. Enunciation and phrasing are crucial in conveying the aural scene Stevie is painting with Gary Byrd's lyrics. "I'm more critical than ever before," Stevie admits. "The more popular you become the harder you have to search for new ways to say things."

Stevie's finally pleased with the vocal, and it is enhanced by the "string section" behind it. Fischbach has outdone himself: the Dream Machine is indistinguishable from a full string section, right down to the bow noise. Finished with the vocal track, Stevie



works out a counter melody on the harpsichord and puts it on tape in under an hour.

Wonder calls for the 16-track of "Lady Prima" and starts experimenting with another tricky vocal. The right feel for the uptempo reggae-influenced song just isn't there tonight so it's finally left for another session.

FAST FORWARD

**Thursday,
September 18,
2:00 P.M.**



Is he hearin' his mother through
The voice of his father in
disguise?

The vocals that would not come last week flow easily, and Stevie sings the song through with only a few minor

touch-ups. Next he adds his harmony part to the chorus:

Come to me, baby—so good
Come lay your head
Come 'til your mama's satisfied

Stevie is singing effortlessly and in a short time the song is ready to be cut, but on another night.

MORE SONGS IN THE KEY OF LIFE

From August 22 to September 18, Stevie Wonder has worked on around thirty songs. Some are ready to be mastered, and others are 2-tracks containing just a keyboard and a work vocal. Each song reveals a part of Wonder's world, and together they are much more than the sum of the parts.

Stevie's unpredictability stems from the impulsive emotion of an artist, not the whim of a superstar. He is gifted with the talent and means to live spontaneously—sessions scheduled for 6 P.M. often start at midnight, while 8 P.M. sessions are sometimes underway by noon. His recordings have a certain looseness within their perfection that reflects this freedom.

The haunting vocals on "Go Have a Rap with God" were recorded at 3 A.M. after Stevie had roused ex-Wonderlove vocalist Denise Williams from a sound sleep. Stevie plans to fly some children in from New York City to do back-up vocals on the exuberant "Good Spirits on Her Way." He has recorded "Contusion" six times in the past year, while "Late December" was written and recorded within a day.

As the album nears completion, Wonder has to make his final choices for the 20 *Songs in the Key of Life*. Each song paints a picture and together they will tell a story. The world on "Village Ghetto Land" acts as a catalyst for the listener to escape by "Going Back to Saturn" where Wonder has envisioned his paradise. The melancholy "Joy Inside My Tears" asks "permission to lay something heavy on one's head," while "All in Fun" is just what it says.

Stevie Wonder lives a large portion of his life in the recording studio—the place he can best communicate his thoughts and emotions. His new album, which was originally entitled *Questions and Answers*, conveys his love of music, people and life. These feelings really are "songs in the key of life."



THE STAX LEGEND IS GROWING.

SRA 12S A new linear-coupled all FET pre-amp which also drives Stax headphones directly. State of the art for \$500.00.


SRX III Electrostatic headphone system for \$230.00. Ultimate musical definition driven by any 50 watt/ch power amp. Headphones without SRD-7 adaptor are available separately for direct Stax preamp coupling.

DA-300 Amplification that was only a dream until now. The world's finest power amp. Ask anyone who has heard it on the world's finest speakers, 150 watts RMS/ch pure class A power. Large, heavy, full features and protection circuits. \$3,600.00



Other available Stax products are the UA7 precision-damped tonearm (\$190.00) and SR5 electrostatic headphone system (\$135.00).

See your franchised American Audioport dealer.

 American Audioport Inc.
909 University Ave., Columbia, Mo. 65201

CIRCLE 64 ON READER SERVICE CARD

Ambient Sound

BY LEN FELDMAN

Understanding Dolbyized FM

By now, just about every home recordist understands the advantages of noise reduction. No cassette deck worthy of the descriptive adjective "high fidelity" would dream of coming to market without built-in Dolby noise reduction circuitry in both the record and playback modes. Users of open-reel tape decks (few of which are equipped with built-in Dolby) often resort to external noise-reduction units such as dbx, Burwen and Dolby to further improve signal-to-noise ratios, beyond the 60 dB or so that can normally be achieved at the higher open-reel tape speeds. The use of Dolby in open-reel recording is particularly important if you do a lot of dubbing or second- and third-generation master taping, since each successive dubbing introduces a finite amount of additional tape-and-electronics noise, and the process becomes cumulative.

Now, a new application of the Dolby noise reduction process is gaining in popularity in the field of FM broadcasting and reception.

Why Dolby on "Noise-Free" FM?

If FM is truly the "noise-free" radio system, why should Dolby be useful for "high fidelity radio?" The fact is that FM is only "noise-free" when you receive a good, strong signal. The S/N ratios quoted in tuner and receiver spec sheets are measured with reference to signal strengths of 1000 microvolts—more signal than the average FM listener receives from most stations in his or her area (particularly if indoor antennas are used). And, with decreased signal strength, background noise (not unlike random tape hiss) increases. Furthermore, the S/N ratios quoted by most manufacturers apply to monophonic listening. In stereo (to which most of us listen), noise can be as much as 20 dB greater for a given signal strength.

It was therefore welcome news more than a year and a half ago when the Federal Communications Commission acted with unusual dispatch and allowed any FM station to add Dolby noise reduction encoding equipment to their signal-processing. This approval was somewhat surprising to those of us who thought we knew how the FCC thinks when making changes in broadcast rules.

Previously, the FCC has been most concerned with

compatibility and non-obsolescence of existing equipment in the field. Yet no direct provision was made for the millions of FM sets that would not be able to decode Dolby broadcasts. This incompatibility results in more than just inability to take full advantage of reduced noise in reception. As readers who are familiar with the Dolby process know, during Dolby encoding, low-level passages of the music have their high-frequencies dynamically boosted. The lower the passage of music in loudness, the more boost is applied to the "highs." The unsuspecting listener who is not equipped with Dolby decoding and tunes to such broadcasts will hear reproduction with constantly varying treble emphasis. Lower-level passages of music sound shrill, while loud passages remain unaltered in tonal response. Turning down one's treble tone control during such broadcasts tends to reverse the situation rather than correct it, for now loud passages sound deficient in treble, while low-level passages tend to sound correctly balanced tonally.

For this reason, Dolby suggested another change in the broadcast rules—a change in pre-emphasis and de-emphasis. Ever since FM broadcasting began, the transmissions have been anything but flat in frequency response. Cognizant of the inherent noise limitations of this broadcast medium, the FCC prescribed that high frequencies should be boosted by a fixed amount during broadcasting. This gets the highs up and over the background hiss (which is also of a high frequency nature) developed in the transmit-receiver cycle. By attenuating the highs in the FM tuner or receiver, correct *musical* frequency response is restored while the hiss generated during the process is also attenuated—improving overall S/N ratio. Pre-emphasis and de-emphasis, though somewhat like the Dolby process, differs from it in that the *amount* of boost and cut is constant, regardless of musical loudness level. The amount of pre-emphasis and de-emphasis is prescribed in this country as 75 microseconds, which simply means that boost (or cut) begins at about 2000 Hz and reaches a value of about 13.5 dB at 10 kHz, as shown in Fig. 1.

Now, there is a limit imposed by the FCC as to how loud a signal may be transmitted over an FM channel, and it is clear from Fig. 1 that this limit will

be reached more quickly if music contains many high frequencies, since they are already being boosted at the studio to comply with fixed pre-emphasis requirements. It's all a matter of trade-offs. We give up some dynamic range (range of softest to loudest

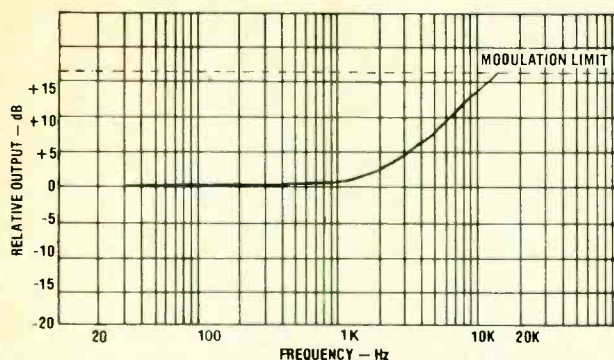


Fig. 1. Currently used 75 microsecond pre-emphasis imposes modulation level limits of FM broadcasters.

sounds) in return for a fixed amount of S/N improvement. As a matter of fact, in Europe and other countries, 50 microsecond pre-emphasis and de-emphasis is the standard, which means that the station engineer has a little more latitude in dynamic range, but the listener has somewhat poorer overall S/N ratios for a given signal strength.

Dolby and Dynamic Range

If you think about how Dolby works, you'll realize that, pre-emphasis and de-emphasis aside, the Dolby system imposes no limitations on dynamic range. For when *loud* passages are to be transmitted, no treble emphasis is added by Dolby and all frequencies may therefore modulate the FM station carrier to its maximum value, limited to +75 kHz by FCC rules.

Dolby therefore reasoned correctly that if full advantage is to be taken of his system in FM broadcasting, the *fixed* amount of pre-emphasis and de-emphasis used by FM stations should be lowered even below the value used in Europe. The value chosen was 25 microseconds which simply means that the fixed amount of treble boost (and cut at the receiving end) begins at about 6000 Hz and only amounts to about 5 dB at 10 kHz. In effect, this *raises* the overall modulation level of musical programming that a studio engineer can safely employ without imposing the need for compressors and other limiting devices which have increasingly found their way into the FM broadcast industry (much to the consternation of the hi-fi listener).

Where Does This Leave Old FM Set Owners?

Obviously, owners of an old FM tuner or receiver who tune to a Dolby broadcast now encounter two degrees of incompatibility. Fortunately, the two aspects of this incompatibility work in opposite direc-

tions. The *net* frequency response heard by listeners equipped with old 75 microsecond de-emphasis (when tuned to a Dolby broadcast) is shown in Fig. 2. Note that the treble rolls off moderately at the high frequency end of the spectrum. However, you will recall that at all but very loudest levels, Dolby encoding tends to boost those frequencies, so, on average, listeners will hear a program that is neither overly shrill nor overly treble-attenuated. Of course, to really enjoy

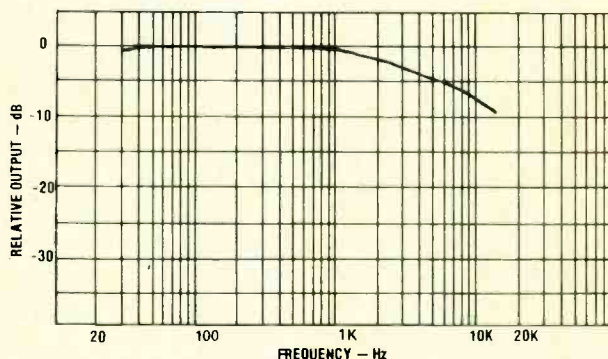


Fig. 2. Net frequency response of old FM tuner when picking up broadcasts which employ 25 microsecond pre-emphasis (not including Dolby action).

the full benefit of Dolby broadcasts, it now becomes necessary to modify your basic tuner or receiver to the new de-emphasis spec (25 microseconds) *and* to add a Dolby decoder at the output of the tuner.

Many new FM tuners and receivers are now equipped with a switch which changes the de-emphasis characteristics from 75 microseconds to 25 microseconds (non-Dolby broadcasts still use the old pre-emphasis value), and a few tuners even contain built-in Dolby decoding circuits. If you own an older tuner or receiver, a serviceman can easily modify it so as to include both values of de-emphasis (a slide switch may be added to the rear panel, and the extra capacitors required hooked up to that switch).

If you are in a strong signal area, you may not notice any improvement at all when listening to Dolby broadcasts (although chances are the station will be sending out programs of increased dynamic range which tends to improve realism of reproduced sound). If, however, you suffer from "marginally noisy" FM (and particularly stereo FM), Dolby can really make the difference between noisy and noise-free reception, since it can improve S/N ratio by as much as 10 dB at the high frequency end of the audio spectrum.

As many readers are aware, the FCC is now considering the adoption of new rules for broadcasting four-channel "discrete" FM. If and when such a new system is adopted, it will further degrade S/N ratios by a few more dB. (You can't crowd more information onto a single channel without sacrificing something.) If and when that happens, the use of Dolby noise reduction will be even more important, for we will need every dB of noise improvement we can get.



PROFILE

By Gil Podolinsky

Bob James, Grover Washington and George Benson were all deeply involved with Creed Taylor Inc. Records (CTI) from the founding of the label. Their talents, along with those of producer Creed Taylor and engineer Rudy Van Gelder played an important role in the current resurgence of interest in jazz. This interview, a composite of three separate interviews, explores the various relationships involved in recording for CTI Records. Ironically, soon after the interviews took place, George Benson left CTI for Warner Brothers, Bob James departed for a position as a producer for Columbia, and there are strong rumors that Grover Washington will leave after his next album to form his own label.

MR: The first thing that one notices comparing two or more records on the CTI label is that all CTI records are Creed Taylor-produced.

Bob James: That's true. However, it's not a situation where there are other producers involved but it goes out under Creed's name. He does all of the producing. It's a question of integrity, really, having the quality control on each release.

MR: It seems that CTI releases, or Creed Taylor production, rather, have become synonymous with prominent string arrangements.

George Benson: Well, there was a time when strings were very prominent on CTI releases, but that was because Creed was trying to work in collaboration with an arranger [Don Sebesky] who was so phenomenal that he didn't want to cover the man up. The problem was that you didn't know whose album it was when you heard it. Now, taking my own album, *Bad Benson*, as an example, the strings on CTI releases are much more subdued. It's less confusing and it helps keep the criticism down which came about due to Creed's excessive use of strings. His whole concept behind that was to bring us *and* jazz up to date by giving us a more modern sound. Now everybody uses strings—more competitive. It's interesting when you realize that only half of the early CTI releases had strings on them, but the

ones that were getting air play and being bought were the ones that had strings, so that must mean something. My second album for CTI, *White Rabbit*, which the radio played to death, had strings and I'm sure that played a part in that album winning a Grammy.

Grover Washington: Yeah, the use of strings doesn't really bother me because we all get together and discuss the total arrangement—does it or doesn't it warrant strings. Jazz in the past was very small-group-oriented. We still do that sometimes but we're trying to change the concept of jazz and not to limit ourselves. I feel that the audience now has a stronger sense of curiosity. Before, they were trying to catch hold of what Trane [John Coltrane] was doing, and Pharoah Sanders and Roland Kirk, but the music was too far beyond the people. So, maybe CTI serves as a bridge to get there or, realistically speaking, just a rung on a ladder so they can understand the music better.

MR: You led right into my next question, Grover. You mentioned that you all get together and discuss the session beforehand. What's the relationship between you and the producer/engineer team of Taylor/Van Gelder?

GW: Well we all—Creed, Rudy and Bob James, who usually does my string arrangements, and I—discuss the session before we do it. I have, as do the

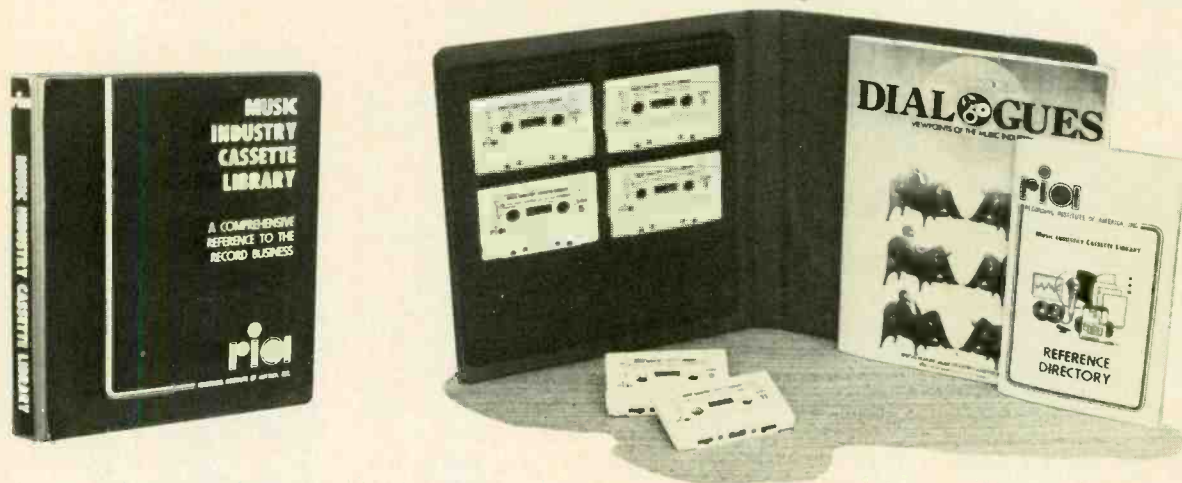
other CTI artists, the final say as to what does and does not go on the album, which has really spurred me to do more writing. I like working with the same people. It's a nice family concept. It's good for me 'cause everybody is still flexible. No one person says "this is the way it's going to be." Sometimes in a session you get so tense you can't even play. But if you know that you have people who are listening to you and have some conception as to what you want, it makes it easier. So, from talk-through session to playing sessions it usually takes about two months to do an album.

MR: George, I've read where you've stated that the more popular or successful you become, the more the label attempts to dictate your playing and the harder it is for you to play what you want. Does that still hold true?

GB: Yes. I had to put my foot down with the label because their attitude is that musicians only play music. It's taken for granted that you have no knowledge outside of playing. I proved my point with the *Bad Benson* album. When it was first mixed it had strings coming out of everywhere! It was really a copy of the *White Rabbit* album. As mixed, it was more than a guitar album—too overbearing. It should *never* overcome me. When you feature an artist, you should never make a sideman out of him by burying his instrument. I put the strings in the

THE RECORDIST'S PRO SHOP

Here's A Guide To The Record Business By The Pros!



Compiled from Recording Institute of America's interviews with key executives and "hit-makers", plus Reference Directory and Dialogue's Viewpoints of industry "stars".

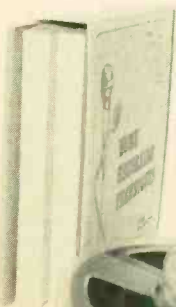
Listen to the industry "pros" describe the workings of the Music Business. Hear the most respected attorneys of the entertainment field define and discuss the legal terminology of Recording Contracts, Songwriter Contracts, Professional Management Contracts. Over 3½ hours of professional reference... could be the most important 200 minutes of your life!

Plus... RIA Reference Directory, including sample songwriter affiliation forms, sample artist contracts, writer contracts, etc., in addition to a Directory of Record Manufacturers, Music Publishers, Personal Managers, Producers and Booking Agents. Also *Record World's* "Dialogues" with over 50 candid interviews from *Record World* magazine, and a cross-section of "star" personality interviews.

You get all the above (regularly \$49.95) for only \$39.95 for MR readers.

Home Recording Course

—a must for every *creative* tape recorder owner!



HOME RECORDING TECHNIQUES is three hours on two 7-inch, 7 1/2 ips, 4-track tapes, including a booklet of diagrams on:

- sample microphone placement
- instrument set-up
- console and machine patching for special effects
- and MUCH MORE!

ONLY \$15.95

ORDER FORM — MAIL TODAY

MODERN RECORDING Magazine
15 Columbus Circle, New York, N.Y. 10023

- Please send [] copies of "Music Industry Cassette Library" at \$39.95 each.
- Please send [] copies of "Home Recording Techniques" at \$15.95.

Please Print

Name _____

Address _____

City _____ State _____ Zip _____

Total Amount _____ Check/ Money Order for \$ _____

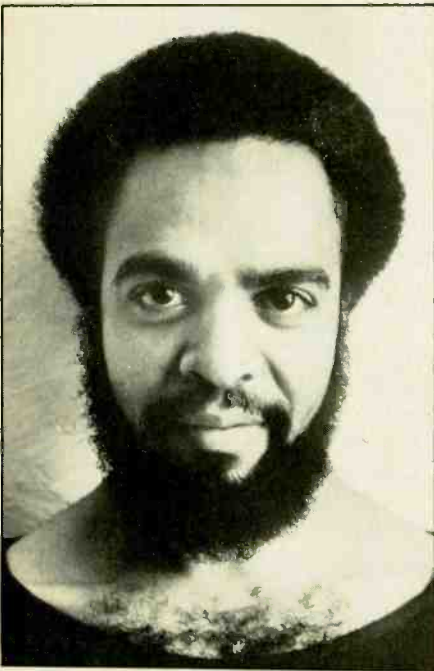
10 Day Money Back Guarantee



George Benson: "I had to put my foot down with the label because their attitude is that musicians only play music."

background where they belong, as a cushion for what I'm playing and it doesn't force me to become dependent upon them.

GW: Right, they have tried to get me to play one way or another. They do suggest, but I have the power to accept or reject which is healthy for both myself and the company. Once that changes, I'll have to go somewhere else—probably start my own label



Grover Washington: "I like working with the same people. It's a nice family concept."

rather than go through the hassle of who to trust.

MR: Grover, how do you approach a session? Sonny Stitt for example sees recording as just another date; you make mistakes "live," so why not on tape? Do you, in a sense, do it "live," or do you recut to perfection?

GW: I have recut only two or three tunes; usually I get it in one or two takes. However, it does take a lot of time with the other, non-solo rhythm parts. The experimentation takes a lot of time. This new album will have five or six tunes so I won't be driving D.J.'s crazy with only two or three!

MR: There's no loss of energy with all these sweeteners, like the strings?

BJ: No, because we cut all the solos first, then add the sweeteners when appropriate. So actually, we're a very small group sound at the start.

MR: Since Creed Taylor does all the producing for CTI, is there ever a conflict of interest where Creed's working on one project and you feel like you're ready to cut and can't?

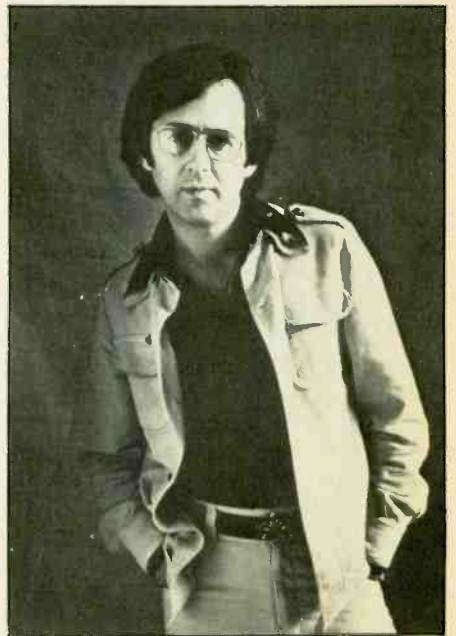
GW: I haven't had that particular problem yet, but I'm sure that if it does arise, I can get some studio time because I do contribute as much as anyone else in the organization.

BJ: Well, it hasn't happened to me in light of my own solo releases, but that is how I've come to produce Gabor Szabo's new lp.

MR: Do you plan to do some more producing?

BJ: I do, definitely. I don't believe in putting all my eggs in one basket. I wrote and arranged all but the title tune for the film *Serpico*, and I want to do more film and TV scores.

GW: I'm more into the engineering aspect. I'm working on getting a good "live" sound that doesn't sound like it was done in a studio. I find that I know fairly much what can and can't be done in a studio, so I don't have to rely much on Rudy. I'd also like to do some audio-video things like TV scores. I'm getting more into space and time. I've always been criticized for playing too many notes, so now I'm learning to use space as notes. The whole thing is geared to expanding receptiveness. It's different in the studio as compared to "live" in a club. In a studio, obviously, the understanding is greater, because it's



Bob James: "I don't believe in putting all my eggs in one basket."

musician communicating to musician. "Live," you first have to bring the people together, then help them to understand.

GB: Well, I've just finished producing my second album of Ronnie Foster for Blue Note. I've had other offers to produce—everything from jazz to rock to R&B, and I do demos all the time. Producing is a very hard job to make a living at, and I'm not trying to make a living at it yet, but it's definitely a possibility.

MR: I understand that you have a home studio—could you tell me something about it?

GB: Well, engineering is my hobby. I really love it. So naturally I had to build my own studio, right? So I have a simple Scully 8-track with an Ampex 440 to mix down to two tracks. My console is an old tube type designed by Les Paul. Some of the greatest records ever produced were done on this console—Wes Montgomery's records for A & M were done on the same equipment, John Coltrane, Miles Davis, the big organ hits like "Walk On the Wild Side," "Misty," lots of Jimmy Smith's hits, Quincy Jones's "Walkin' in Space," as well as Grover's [Washington] first hit record. I love the feel. Tubes are great, you get a better feel than with solid state components, but you'll find components being used because they're more consistent. The first album I did with Ronnie [Foster] was cut both at my home and Electric Lady; the new one was cut at A & R. Miles Davis' band has a production company and they use my studio also.

MR: Maybe you can tell me something of the legendary Rudy Van Gelder and his studio.

GB: Well, Rudy doesn't like to have people know what he's doing. He is using solid state components, and he's gone from 8 to 16 tracks. He does all of his own work, all the way down to cutting the master disc. It's really a beautiful operation. He does every CTI release so there's a consistent level of quality maintained.

GW: Yeah, with Rudy it's not just a gig, but a heart-felt thing.

MR: As artists, are you becoming more involved in the recording process?

GB: We are beginning to get into the mixdown aspect because we realize that a man can get rich with the right mix. It's very critical because a hit record can be lost in the mix, so we're slowly getting involved in all aspects of the production.

MR: To what extent has Creed been an influence upon your recording?

GB: I learn from everybody. Creed's probably the best jazz producer in the world for making successful jazz records because he knows how to present an artist, as can best be exemplified by Freddie Hubbard—not in telling him what and how to play, but by showcasing it to Hubbard's best advantage. Grover's *Mister Magic* [the biggest-selling record in CTI history] is another milestone.

MR: After working so closely with not only Creed and Rudy, but with each other, since you often serve as sideman on other CTI releases, is it difficult to do non-CTI sessions?

BJ: It is hard to do outside sessions because you get used to having a hand in the overall production. Coming from that to keeping your mouth shut is difficult. However, I do find that in doing outside sessions more and more people will ask me my opinion, and I think that comes from the success of CTI.

GW: I haven't been doing sessions other than CTI 'cause they haven't been calling. I would love to do some. I hope they don't think I'm a big star and unapproachable!

MR: [Benson, James and Washington recently completed a tour in a CTI package which includes Joe Farrell, Ron Carter, Johnny Hammond and Hubert Laws.] How does playing together on a tour differ from recording?

BJ: Well, it has its good and bad side. You don't have to put a group together because everyone is a sideman for everyone else. On the other hand, you can't really delve into what you are.

GW: It's the time factor that's the problem. It's hard to play just in spots. The tour is close to the album sound but it's a lot looser. People can really appreciate when it's not done verbatim. And the tour, really, exposes jazz, especially to the 10- to 18-year-olds who can't go to the clubs.

GB: The tour doesn't have the same feel as my own band; it's a little bit inhibiting. On the other hand, when you play with these musicians, nothing but good can come of it. I think we give the people a lot for their money.

MR: In closing, what do you think of the production at Blue Note? Doesn't it tend to copy CTI?

GW: I really haven't had much time to listen to that much, but if that's the way it's coming across, it's definitely a form of flattery.

MR: Yes, but isn't it a bit like killing the goose that laid the golden egg?

GW: Well, if it gets to that point, we'll just have to go into something else, another concept.

GB: From what I've heard, Blue Note is definitely imitating our concept, only they're at a stage where we were years ago when the strings tended to dominate and strangle the artist. Really, it's a tribute to Creed.



WE CALL IT SUPERMIKE

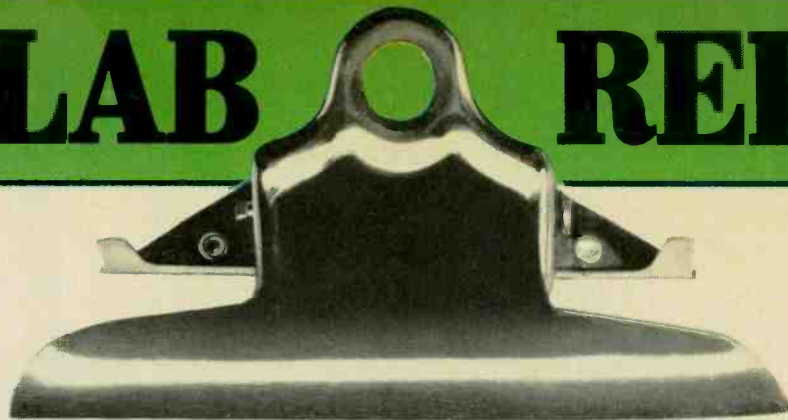
The Beyer M.500

You'll call it a revelation. For you've never used a microphone quite like the M.500. It combines the sharp attack of a condenser and the sturdy reliability of a moving coil with the unduplicatable presence of a ribbon. And at \$147.50, it may be the best investment you'll ever make. Complete technical specifications available upon request.

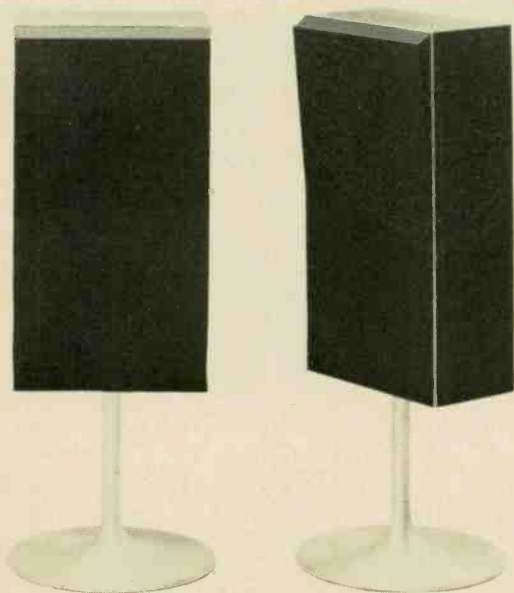
*Another innovation from
Beyer Dynamic,
the microphone people*

Revox Corporation
155 Michael Drive, Syosset, N. Y. 11791

CIRCLE 73 ON READER SERVICE CARD



NORMAN EISENBERG AND LEN FELDMAN



Beovox M70 "Phase Link" Speaker System

General Description: The Beovox M70 is the top-of-the-line model in a brand new speaker system series just introduced by the Danish firm of Bang & Olufsen. The generic name for the new line—Phase Link—suggests a main design goal, that of eliminating phase distortion in multi-driver reproducers. By way of explanation, phase distortion is a phenomenon of sound transmission and/or propagation in which some of the tones, or musical information, are delayed in time with respect to other tones of which they should be a simultaneous part. The result can be a somewhat fuzzy kind of sound, or a sense of "canned" sound, often accompanied by a lack of "presence" or imperfect "localization" in stereo, or a blurring of transients.

To overcome this problem and create a more "phase coherent" speaker system, B & O engineers have developed the new systems with three distinct features. One is the use of a "filler" driver—the "Phase Link" element—which corrects for the phase error (between amplifier signal and speaker output) that otherwise would be present. A second feature is the use of a

newly devised frequency crossover that is more of a bandpass circuit than a conventional dividing network. The final step is an angled front panel on which the drivers are mounted, with the angle calculated to deliver the output of each driver without interfering with each other and yet reaching the listener at the same instant, another factor in reducing relative time-delay among different frequencies.

Besides the filler driver (itself a 5-inch cone), the M70 contains three main drivers: a 10-inch woofer, a 2½-inch midrange cone, and a 1-inch dome tweeter. Frequency division occurs at 500 Hz and at 4,500 Hz. No controls are provided. Rated impedance is 4 to 8 ohms; recommended input power is at least 5 watts; power-handling capability is up to 70 watts continuous or 120 watts of music load.

The M70 is one of the handsomest speaker systems we ever have seen. The enclosure is rosewood, fronted by a black cloth grille framed in aluminum. Supplied with the unit is a brushed aluminum pedestal for floor placement; the mounting bracket on the pedestal enables you to "trim" the inclination of the system to adapt it to your favorite listening position.

Test Results: The M70 is supplied with an unusually complete and, for a speaker system, "conservative" set of performance specifications—all of which are met. Frequency response was outstandingly linear (for a speaker), confirming the manufacturer's claim of ±4 dB from 38 Hz to 20,000 Hz, or +4, -8 dB from 27 Hz to 20,000 Hz. The largest portion of the response,

from 50 Hz to 15,000 Hz, showed even less dB variation than ± 4 dB. Dispersion was over a very broad angle, with virtually no directional effects showing up until beyond 10,000 Hz. Impedance across the audio band averaged a bit higher than 4 ohms and was unusually smooth (once past the typical bass rise) out to 20,000 Hz.

Although it is a sealed enclosure type of system, the M70 displayed more than the moderate-to-low efficiency typical of this class of loading. With 1 watt of pink noise fed to the speaker, the sound-pressure level measured at a distance of 1 meter on axis came to 88 dB. It can accommodate normal program material delivered by amplifiers (or receivers) in the over-100 watt class, and it responds to increased amplifier drive very smoothly, with no sense of audible strain or roughness. A wide-range system, both in terms of frequency coverage and dynamic span, the M70 impressed us in tests as suited for a wide variety of room sizes as well as of program material.

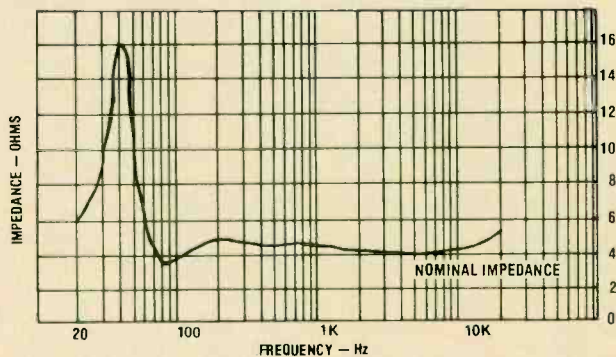
This was readily confirmed in listening tests conducted in several different rooms, with a pair of M70's connected into different systems and playing a wide assortment of program material. Listeners consistently praised the sonic presentation in such terms as "utterly transparent," or "remarkable clarity of middles and highs." One listener felt he would have preferred "a little more bass at the very low end," and this remark occasioned a lively debate on what is "real" and "false" in the deepest bass reproduction with no conclusions since the arguments all were quite subjective. As a final verdict, MR rates the M70 very highly, as one of the best "2 cubic-foot box systems" presently available.

General Info: Dimensions of a B & O M70 are 25½ inches high; 13¾ inches wide; and 10¾ inches deep (overall). On the pedestal, complete height goes up another 12 or so inches. Weight is a shade over 55 pounds. Advertised price (including stand) is \$350.

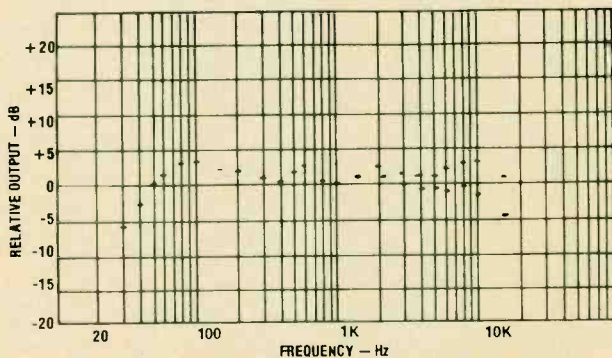
Individual Comment by N.E.: I, for one, always have felt that phase distortion was an important, and underemphasized, factor in audio design—especially of speaker systems. Examination of many speaker systems offered in recent years has indicated a surprising number of multi-driver reproducers that were connected internally out of phase, and the sum total of inquiries into this has netted no consistent explanation or attitude from various manufacturers. It is encouraging to see at least one manufacturer who has taken note of this problem and has worked out a scientific (and audibly valid) approach and solution. The M70 is at least the equal of other "box" speakers in its size and price class, and perhaps clearer through the mid-

range and highs especially in terms of its ability to reveal inner ensemble detail. It is an easy speaker to listen to and to live with, and its beautiful appearance certainly enhances its appeal.

Individual Comment by L.F.: N.E. and I tested this speaker completely independently of each other, using different samples. It is significant, I believe, that we arrived at virtually the same conclusions. I, too, for some time, have felt that correct phase correlation is important in multi-driver systems. The quality that this coherence imparts to reproduced sound is readily apparent in the M70, especially in terms of its high accuracy in handling musical transients. Incidentally, I discovered early-on that the pedestal is not an optional accessory to be used or ignored as you choose. It is, I find, a necessary part of the system. From a long-range viewpoint on audio in general, it may be that with their studies of phase relationships, and the concepts embodied in this new product, B & O may well have triggered a new aspect of research into how we hear—something that could have widening influence throughout the audio field.



B & O M70: Impedance characteristic.



B & O M70: Frequency response.

CIRCLE 40 ON READER SERVICE CARD



Sound Workshop Model 882M Recording/P.A. Mixing Console

General Description: The Sound Workshop Model 882M Console consists of two separately available sections. The Model 882 is the basic eight-in, two-out console. If bought together with the Meter/Monitor Panel (Model 801), the two pieces can be assembled in a single retaining cabinet, as shown.

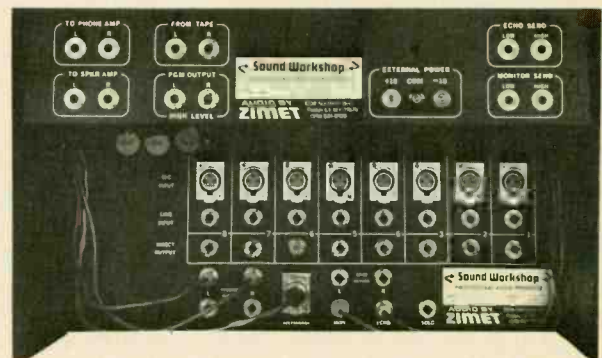
The basic Model 882 consists of eight identical input channels, each of which contains all of the following switch and control features, listed from panel top to bottom: A mic/line switch, a trim pot which varies gain and headroom of the line amp to prevent input clipping and to optimize the channel for lowest noise and distortion, high frequency and low frequency continuously variable EQ controls, a solo switch that sends switched input channels to a solo output buss (and also supplies operating voltage to an accessory jack for use with a monitor interrupt relay), and a mute switch to disconnect the input channel from all output busses except "solo" and link. Next comes a pre-fader monitor send control which feeds channel input to stage monitors or to musicians' headphones in the studio. The next control is a post-fader echo send to feed the channel input to echo or other special effect devices. A pan-pot in each channel positions the input anywhere from extreme left to extreme right, and the overall fader control adjust channel level feeds to all output busses except the monitor buss.

Controls located at the right of the console include master output controls for left and right channels, echo-return level controls for each channel, an overall gain control of solo buss output and one for overall level control of the monitor output buss. A push-button power switch turns on the console which, by the way, can be DC-powered by a ± 18 volt supply if AC is not available on location.

The upper add-on section contains left and right channel meters as well as a meter which can be switch-selected to indicate echo or monitor levels. Separate gain controls determine final output level to the moni-

tor buss, phone outputs and speaker amplifiers; push-buttons above each of these controls actuate the appropriate output. There's also a solo-defeat switch and a selector switch for feeding echo, monitor, mono program, stereo program or taped program to the aforementioned amplifiers.

The rear panel of this combination console has XLR three-terminal mic input jacks, though mic inputs are unbalanced. Mics of 250 to 600-ohm impedance can be accommodated. There are also line inputs (high level) which require a standard phone plug, as do each of the direct outputs from each channel which Sound Workshop thoughtfully made available at the rear of the unit. These outputs are really "link jacks" of the three-conductor variety. Plug in a two-conductor plug for use as direct output retrieval, or use a three-conductor plug to insert external signal processing devices such as limiters, equalizers, phasers, etc. through each input channel. In addition, there are left and right program outputs, phone outputs, echo-return inputs, monitor, echo and solo outputs. In the more expensive 882M configuration shown, program, monitor and echo outputs are hooked right into the meter/monitor upper panel which provides a gain of 14 dB, providing outputs at a rated +4 dBm (as opposed to the -10 dBm output level delivered by the basic Model 882



alone). To add a little frosting to the cake, Sound Workshop has even provided a five-pin XLR accessory jack (and thoughtfully included a matching unwired plug which as a rule is not too easy to come by) for powering external accessories and to provide voltage

for the monitor-interrupt relay built into the upper section of the combination.

Test Results: MR checked all of the published specifications for each channel of the 882M and found that the unit out-performed its rated specs in almost every instance. For example, actual measured total harmonic distortion at 1 kHz for 0-dBm indication on the level meters was a miniscule 0.02% and 0.019% at 100 Hz, rising to only 0.025% at 10 kHz. Input and output levels were exactly as rated, within a half dB or so, except for the line input which required a -26 dBm input for rated output as opposed to the -28 dB claimed. Signal-to-noise ratio, measured from a 0 dB reference level, was exactly 70 dB as claimed; we figured that this corresponds to an equivalent noise input of around -122 dBm, an impressively low number for a unit in this price class.

Headroom was measured at 20 dB—short of the 28 dB claimed, but impressive nevertheless. We based our measurements on a THD of 0.1% so if you wanted to push it a bit, you could go a little further—say another couple of dB before the distortion really takes off. Pan pots were perfectly calibrated, in that mechanical center of rotation decreases output to each channel by exactly the required 3 dB compared to a left-only or right-only setting.

General Info: Basic 8-channel mixing console (minus meter/monitor panel) measures 17¼ inches wide by 10¼ inches deep, and slopes from 3½ inches high at the front to 6¼ inches deep at the rear. Combining it with the meter/monitor section results in overall dimensions of 17¼ inches wide by 10½ inches high by 16½ inches deep. Units may be installed in rack-panel mount available from the manufacturer. Prices: Model 882, basic console, \$1200; Model 801 meter/monitor panel, \$375; both units together as model 882M, \$1500. Units come with two-year warranty on parts and labor. Accessories supplied include aforementioned five-pin connector, and an allen wrench to help in removing knobs. Operating manual is excellent. Operation is from 120 volts AC, or—via accessory jack—from an external ±18-volt DC supply. Products distributed exclusively through Audio by Zimet, Roslyn, Long Island, N.Y. 11576.

Individual Comment by L.F.: If you've been conditioned to work with sliding fader controls and to sit behind a fancy-looking board, you may be turned off by the somewhat home-brewed look of the Sound Workshop 882M. In our case, that first reaction quickly disappeared as we started to put the console through its paces. The nice thing about this mixing board is that it combines the features that a P.A. man would look for with the best features demanded by a studio mixdown engineer. There's also room for expansion (you could easily add a second unit for 16-in capability and end up spending less money than you would

for some of the fancier looking 8- or 12-channel boards around).

Because of its compactness and the number of controls provided I found that spacing was a bit tight for my fingers, but then not all are as big-handed as I am.

I went deep inside the Model 882 and can report that the workmanship, layout and overall design are as professional as anything I've seen in any price range. Circuit modules for each channel are easily removed simply by unscrewing the nuts holding all the pots of that channel in place, and a long mother-board ties everything together. Every single board, including the separate power supply board at the rear, is disconnectable via multiple male and female connectors and therefore every board (all of which are, of course, constructed on glass-epoxy material) can be replaced or serviced without heating a soldering iron. I also had access to a full schematic diagram of the unit, and the combination of linear IC's and transistors used is truly state-of-the-art. Running the mic inputs unbalanced eliminates the need for costly (and not always noise-free and distortion-free) mic transformers, which is an added bonus as far as I'm concerned.

All pot settings have good repeatability and, at least during our brief usage, were as noise-free as any slider controls we've ever used and then some. Make no mistake about it, the Model 882M is priced like some of the mixers sold for home recordists who want to make like professionals—but it performs in a way that should please studio and P.A. engineers who are accustomed to gear costing over twice as much.

Individual Comment by N.E.: Eight channels, each with three switches and seven knobs, plus additional controls on a panel 17¼ by 10½ inches does make for compactness, but if this does not bother you, consider this unit as a versatile but low-priced studio tool. If you do, I feel that both units (the console itself and the meter/monitor section) really should be purchased together—they work very well with each other and buying both at once will save you \$75.

SOUND WORKSHOP MODEL 882: Vital Statistics

PERFORMANCE CHARACTERISTIC	LAB MEASUREMENT
Input, mic	1k Ohms nominal impedance (unbalanced); -73 dBm for rated output; -6 dBm max input before clipping.
Input, line	180 k Ohms bridging; -26 dBm for rated output; +35 dBm max input before clipping.
Trim control range	28 dB
Output levels	-10 dBm into 10k Ohms or higher (+4 dBm with added gain in 882M version).
Headroom	20 dB above rated output
Frequency response	20 Hz to 20 kHz, ±0.5 dB; substantially flat to beyond 50 kHz.
Distortion	Input to output, less than 0.15% from 20 Hz to 20 kHz. Normal operating conditions, less than 0.08% (worst reading was 0.025%).
Signal-to-noise ratio	70 dB, input to output
Equalization	±15 dB at 100 Hz and at 10 kHz.

CIRCLE 43 ON READER SERVICE CARD

Luxman C-1000 Stereo Preamplifier



General Description: The Luxman C-1000 is a stereo preamplifier-control unit for use ahead of a power amplifier in a playback system. It accepts signals from various sources, and it provides equalization, gain, filtering, and other control functions. It is evident in the unit's design and layout that a great deal of attention has been paid here to some fine points of circuitry, such as virtually overload-proof phono-inputs. Distortion is exceptionally low. The tone-control system is unusually elaborate, and is designed to provide a myriad of tone adjustments. It is possible to connect two tape recorders to the C-1000 and dub directly from either one to the other while also listening to other sources at the same time. The C-1000 also provides for direct speaker switching, an unusual feature for a preamp.

The unit's appearance is very "de luxe" and the controls all work with professional smoothness. At the upper left of the front panel is the input selector knob with positions for aux 1, tuner, phono 1, phono 2, and aux 2. To its right are four tone control knobs. One handles bass (on both channels simultaneously); another handles treble in similar fashion. Under the bass knob is a low-frequency turnover selector with marked frequencies of 150 Hz, 300 Hz, and 600 Hz. Under the treble knob there's a corresponding control for high frequencies marked 1.5 kHz, 3 kHz, and 6 kHz. Under the selector there's a "linear equalizer," a five-position switch designed to "tilt" the entire response curve one way or the other. The center position is flat, and there are two degrees of "up" or "down" tilt on either side of center. Its purpose is to subtly augment the regular tone controls; it effectively "rotates" the overall response around a 1-kHz axis so that a linear and gradual increase (or decrease) is achieved at one end of the frequency band while a corresponding decrease (or increase) occurs at the opposite end. This occurs on both channels simultaneously; it is impossible, that is, to trim one channel differently from the other.

The "tone control switch" is a three-position toggle switch to the right of the knobs. It is marked "tone control and low boost," "off," and "tone control." In the first or top position, this switch puts the tone control knobs into action and also provides a boost of up

to 8 dB at frequencies below 70 Hz. It functions, therefore, as a kind of sophisticated "loudness compensation." Combined with the bass tone control and its frequency selector, it is designed to augment specific sections of the bass response without necessarily boosting all the lows at the same time. In "off" position this switch removes the bass and treble knobs and their associated action from the preamp's circuitry. In the third or down position, this switch activates the bass and treble knobs but without the low-boost function just described.

To the right of this switch are six more similarly styled toggles. In order, from left to right, they are: a low-cut filter with positions for 70 Hz, off, and 10 Hz; a high-cut filter with positions for 7 kHz, off, and 12 kHz; a left, both, or right channel selector; a reverse channel, normal stereo, or mono selector; the tape dubbing switch with positions of tape deck 1 to 2, off, and tape deck 2 to 1; and a tape monitor switch with positions for deck 1, off, or deck 2.

Next comes a continuously variable pot for channel balance. This control is concentric with a volume attenuator which may be used for 20 dB of level cut relative to whatever output level has been set on the main volume control. This knob, located at the top right corner of the panel, is unusual in that it also doubles as a "touch-to-mute" control. That is to say, touching the center portion of the knob reduces gain by 16 dB; then touching the outer portion of the knob restores full gain. Instant and temporary muting of a sound system without disturbing its original signal level is a feature found on some other preamps, of course, but this is the first we have seen to accomplish it without a separate switch. Bass, treble, and volume controls are stepped types with detents around their rotation. The channel-balance knob has a center-position detent that indicates equal levels to both channels.

At the lower right of the panel are two buttons for selecting either or both pairs of stereo speakers, a larger button for power off/on, and a stereo headphone jack. The speaker selector feature works only if connections are made between the system power amp and a group of special connectors at the preamp's rear. This hook-up also is required to make use of the headphone jack.

The front panel also contains two screwdriver adjustments. One sets the impedance of the phono-1 input (30 K, 50 K, 100 K). The other handles sensitivity levels for phono 1 and phono 2 inputs and is marked for -5 dB, 0, and +5 dB. Finally, the front panel has two pilot lamps. One comes on when the set is energized; the other, when the volume-muting feature is used. The main pilot lamp also serves as a warning blinker when the unit's time-delay circuitry is activated, which it is for a few seconds following initial power turn-on so as to mute the output terminals in order to avoid noises.

On the rear panel of the C-1000, to begin with, are the terminals for making the amplifier hook-up to permit speaker selection and headphone use. These consist of three groups of press-to-connect terminals (that accept stripped leads): one group is for leads from the power amp; the other two groups are for hook-up to two sets of stereo speakers. Other signal connections are handled by standard pin jacks arranged in stereo pairs for: phono 1 and 2, tuner, aux 1 and 2, monitor in (playback) and recorder out for each of two stereo tape decks, and for feeding two separate power amplifiers. The aux 1 and the tuner inputs are controlled by their own level adjustments located just under the jacks. The tape connections have optional DIN receptacles for use with unitized connectors. There also is a grounding terminal, a 1-amp fuse holder, the preamp's power cord, and four AC convenience outlets, two of them controlled by the front panel off/on switch.

Test Results: In every test performed on the C-1000 by MR, the unit either met or exceeded its published specifications. For instance, overload on phono input is given as 450 mV; the test sample made it to 460 mV. The response at 30,000 Hz is allowed a -0.5 dB variation; MR's sample showed 0 dB. Signal-to-noise on phono inputs was stated as -65 dB; the test sample measured -72 dB. And that's the way it was throughout the lab measurements which, in sum, verify the rigorous electronic design and general excellence of this unit. Tests of the various tone control options, including that of the "linear equalizer" tilt, further verified the action of these features.

Special listening tests were set up in which an A/B arrangement permitted listening to master tapes played through a high-powered system first through the C-1000 and then bypassing it, with the tape deck feeding directly into the power amp. So long as all controls on the C-1000 were set to their indicated flat positions, no audible differences could be detected. The C-1000, in other words, could not be "heard" at all in this test, which is probably the highest compliment one can pay to a preamp-control unit.

General Info: Unit comes in wood case. Overall dimensions are 19 inches wide, and 6¹/₈ inches high, allowing for feet under case. Depth, including knobs and connectors, is 10¹/₈ inches. Out of cabinet, unit is 6¹/₈

inches high, 9³/₈ inches deep. Weight is 22 pounds. Price: \$895. Owner's manual: rough draft only available for test deadline.

Individual Comment by L.F.: In general, there have been two approaches to the design of a system preamplifier-control unit. There are preamps that sport a minimum of controls and simply provide adequate gain to drive the power amplifier that follows. These units offer extremely good signal-to-noise level, accurate RIAA phono equalization and, sometimes grudgingly, a pair of bass and treble controls.

The other approach in preamplifier design is to include every conceivable type of switching and control flexibility, elaborate tonal compensation circuits, etc.—or, to create a true "control center" for the serious home music enthusiast. Often, this total flexibility is gained at the expense of performance. For example, many preamp makers include a "tone defeat" switch so that the purist may bypass what he or she considers to be a "distortion"-producing section of the preamp circuitry. Lux Audio is obviously of this second design school, but the first thing that caused us to suspect that this is a preamp with a difference is that, while the tone defeat switch is indeed present, our laboratory measurements disclosed that there is *absolutely no difference* between the THD and IM readings taken with the tone controls in the circuit or out! And we're talking about distortion readings of 0.0036 for rated output at that.

Tone controls with variable turnover points are not unique to Lux—they have been around on better preamplifiers for some time. But the so-called "linear equalizer" is a Lux exclusive, and provides a subtle tonal adjustment for records that just cannot be achieved in any other tone control arrangement. If anything, I wish Lux had allowed this "response tilting" feature to work on all program sources instead of confining its use to phono reproduction.

The substitution of the "low boost" feature (a slight, fixed boost below 70 Hz when this switch is activated) for the more commonly accepted "loudness control" is, in my view, highly justified. Most "loudness compensation" circuits are calibrated in an arbitrary fashion anyway, and seldom correspond to the desired Fletcher-Munson curves because program source levels tend to vary so that, for example, "phono" may sound loud with the master volume control set at 12 o'clock, while tuner outputs may require a setting of 3 o'clock for the same volume level. There is no way that a loudness control, as often supplied, can properly compensate for both of these situations. The knowledgeable audio buff would, in my opinion, prefer to compensate for lower-level listening by means of the highly flexible tone control system provided in this unit. The "low boost" is therefore intended as fixed compensation for speakers that don't quite reproduce that lowest octave, or ones that cannot be positioned for optimum bass energy radiation, and it works well in this application. In my view, the

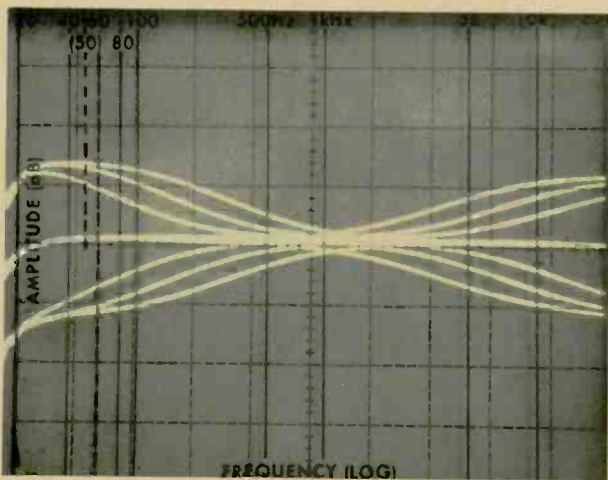
look, feel, and operation of the Lux C-1000 justify its price tag of nearly \$900.00. The inveterate knob-twirler should have a field day with it. I'm not sure that there are costlier preamplifiers around these days, but I doubt if there are any that offer the performance and control versatility of this elegantly styled and executed showpiece from Lux.

Individual Comment by N.E.: Without a doubt, the C-1000 is an eminently clean front-end playback unit and the fact that in tests it easily met or exceeded its specifications, which are pretty rigorous to begin with, attests to its superiority as an audio product. But this unit raises the question: Where does functional versatility end, and gimmickry begin?

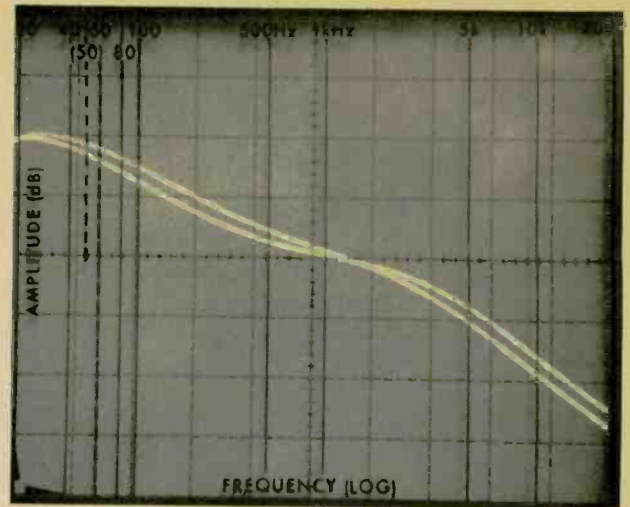
The premium price quoted for this unit relates only in part to its performance; a good deal of the high price of the C-1000 must be attributed to its features, many of which relate more to cosmetics, or a cultivated taste for gadgetry, than to basic audio performance. I'm thinking of such touches as the "linear equalizer," the touch-mute switch and its indicator, the attenuator volume control, the blinker feature of the pilot lamp.

On the tone controls, by the way, if they went to the trouble of having stepped rotators with detents why not also provide markings for reference? I note, too, that the controls are not separate per channel, which seems inconsistent with the "de luxe" concept. In any event, after using them in various combinations, I am not too convinced of their ultimate superiority or audible utility vis-a-vis other tone control set-ups.

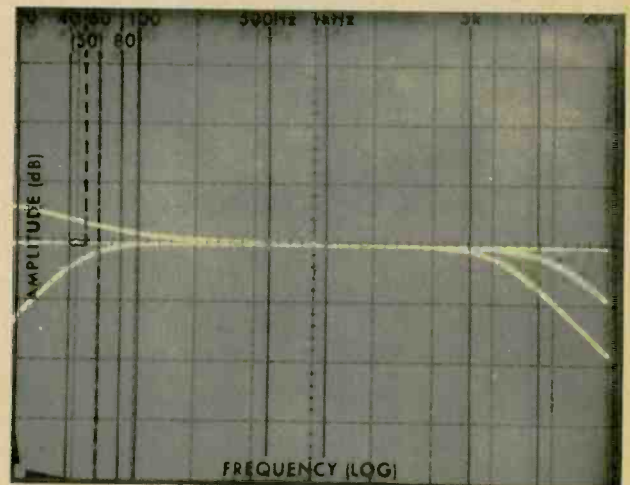
On the plus side, the tape-connecting facilities are handy and well thought out. The speaker selector is a good idea for a preamp, and, while its inclusion on a preamp is rare, the C-1000 is not the first or only preamp to offer it. As for the owner's manual, I have not seen a final version, but I would expect that its wording and presentation be clarified over the rather rough draft sent with the test sample.



Tone control ranges at different bass and treble turnover points on Lux C-1000. Each vertical division on 'scope photo equals 10 dB.



"Linear equalizer" circuit "tilts" RIAA playback curve between extremes shown in sequential scope traces.



Response of fixed "low boost" switch (rise in response below 70 Hz) and action of low and high cut filters as recorded on spectrum analyzer 'scope. 10 Hz cut does not appear, since sweep is from 20 Hz to 20 kHz only.

LUXMAN C-1000 STEREO PREAMP: Vital Statistics

PERFORMANCE CHARACTERISTIC	LAB MEASUREMENT
Harmonic distortion at rated output (2 V)	0.0036%
Frequency response	±0.2 dB, 10 Hz to 50 kHz
S/N ratio, phono inputs (for 2 V out)	73 dB below 2.5 mV Input
high level inputs (2 V out)	81 dB
Input sensitivity (for 1 V out), phono	2.5 mV
high level	150 mV
Phono overload (for 0.1% THD)	460 mV
RIAA equalization accuracy	Within 0.1 dB, 30 Hz to 20 kHz
IM distortion (2 V out)	0.013%
Output for 0.1% IM distortion	13 volts
Touch mute amount	16 dB

CIRCLE 61 ON READER SERVICE CARD

Yamaha TC-800GL Cassette Recorder



General Description: The new Yamaha TC-800GL is an unusually, and excellently, designed cassette recorder that combines some very useful features with high performance. It is essentially a top-loading unit, but when installed, a support flap on the underside tilts the deck forward so that the convenience advantage of the front-loading design is, to a great extent, realized. This slant design also relates to the styling of the control panel which is a series of steps, each step containing another control function. When set up, the TC-800GL looks attractive and inviting, with a functional logic to its layout that is a tribute to the talent of its designer, one Mario Bellini.

The Yamaha is a cassette deck that you can operate on regular AC line voltage, or from an external 12-volt DC source, or from a self-contained (internal) battery source consisting of nine "C" cells. It thus can serve as an indoor (home, studio, etc.) unit, as a vehicular unit, or as an on-location portable—and as far as MR's tests could determine—with no compromise in performance as a result of this versatility.

The TC-800GL also has a variable pitch control—so far as MR can determine, the only cassette deck other than the two top Nakamichi models (the 700 and the 1000) to sport such a control. It has no effect during recording, but it may be used on playback to vary musical pitch by ± 3 percent, and thereby match the recorded sound precisely to the pitch or tempo of a "sing-along" or "play-along" activity.

A Dolby-B circuit is built in, plus the option for using chrome or standard low-noise tapes. The selector switch need not be used when inserting a chrome-tape cassette that has the extra hole along its rear edge, since a sensor on the Yamaha will readjust the bias automatically. Input arrangements and controls permit mixing of microphone and line signals. The unit has a memory rewind, a built-in limiter option, and it may be started and stopped by an external timer.

The cassette well is at the left, and its cover has a transparent section that permits you to observe tape motion and the amount of tape on both supply and take-up hubs. Below this section are seven push-buttons for: eject, stop, fast reverse, normal forward, fast forward, record (colored red), and pause. The righthand portion contains the novel "stepped" arrangement mentioned. At the very top is the meter panel. There are two amply proportioned VU meters,

each calibrated from -40 to +6. Each meter has its own peak-level indicator. The meters, by the way, function on both recording and playback. Centered between the two meters are two printed legends that light up accordingly to show "RECORD" mode and "DOLBY." The right meter doubles as a battery check indicator at the press of a button below it. Next to this little button is a switch to control the lighting of the meter panels in battery or external 12-volt DC operation—a nice touch in the interest of conserving power. To the left of these two buttons is a three-digit tape index counter and its reset button.

The next step below contains the controls for memory, limiter, Dolby noise-reduction, tape-type selection, and power off/on. A step below this introduces the pitch control; the next step down contains playback level controls; a step lower contains the input controls for microphones; the bottom step contains the line input controls. Pitch and signal level controls are all sliders that move over numbered scales to indicate relative degrees of increase or decrease. The level sliders are arranged in stereo pairs with each channel marked; their positioning permits using either in a pair separately or both simultaneously. The level is increased as a slider is moved from left to right.

The underside of the TC-800GL, which is raised when the supporting flap is used, contains the standard connectors for the AC power cord, and line signals in and out. There's also a lid to get at the battery compartment. Input jacks for microphones are on the left side of the unit, in a group that also includes a headphone output jack, and a socket for running a cable from an external 12-volt DC source.

The Yamaha unit comes in a self-contained, very dark gray high-impact case. The owner's manual is a 26-page booklet that contains, in addition to full instructions for using the deck, useful advice on recording—including material on microphones, mixing and so on, maintenance, and recommended tapes by brand and number.

Test Results: In testing the Yamaha TC 800GL, MR ran critical tests twice, using both a standard low-noise tape (Maxwell UD-XL-60), and a chrome tape (TDK-KR-C60). Both of these are among the tapes recommended in the owner's manual. The results, in sum, confirm the published specs for the unit and add

up to a better-than-average cassette recorder. Best high-end response was obtained, of course, using the chrome tape—which also improved the recorder's S/N ratio. With either low-noise or chrome tape, the use of the built-in Dolby system also improved S/N. Distortion in general was very low; mechanical wow and flutter were astonishingly low.

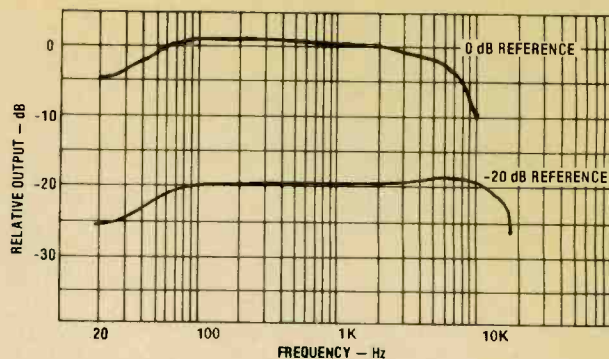
For optimum results, MR recommends using chrome tape with the Dolby on. In this mode, frequency response runs within ± 3 dB from 40 Hz to 15,000 Hz. Distortion at zero VU was 1.2 percent, rising by a mere 0.01 percent at +3 VU. Wow and flutter remained well down at only 0.04%; signal-to-noise was an estimable 67 dB, which makes the Yamaha one of the quietest-running tape machines of any format presently available.

The Dolby circuitry was found to be accurately calibrated, and the recording set-up provides ample headroom for strong signals. The meters are correct too, and serve more than cosmetic purposes in judging input levels. Loading a cassette is foolproof in that there is no need to place the cassette "just so" in order to have it engage and run. Microphone and headphone jacks are standard size ($\frac{1}{4}$ -inch) as opposed to the mini-jacks often found on compact recorders, and their location makes them readily accessible. All controls operated smoothly and did their intended chores.

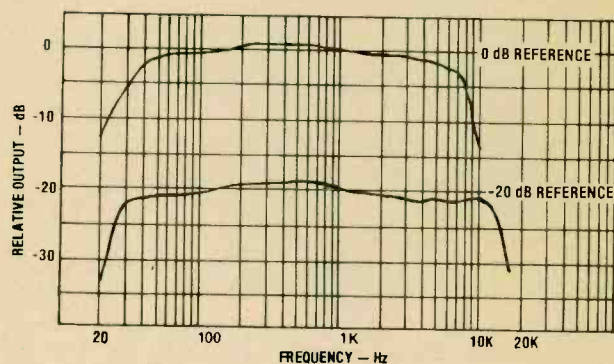
General Info: Dimensions are $12\frac{3}{16}$ inches wide and $12\frac{3}{16}$ inches deep. The height of the Yamaha varies, as per its slope, from $6\frac{3}{8}$ inches to just under 1 inch. Weight is 11 pounds (without batteries). Price: \$390. Owner's manual is excellent.

Individual comment by L.F.: I am impressed with a cassette recorder that performs well indoors and that also can be taken into the field to produce quality results. I also feel that this is the first machine that presents its operating and control panel to the user at the most ideal angle. However, I found it difficult to get used to the slider controls that increase the gain when moved from right to left. Frequency response, while very good, did not seem outstanding for a machine in this price class.

Individual Comment by N.E.: I agree with L.F.'s comments regarding the indoor/outdoor quality and dependability of the Yamaha TC-800GL. Ditto for his preferring the sloping panel—it makes the unit one that you can install just about anywhere and still have good access to it. As for the sliders moving from right to left, this feature did not bother me at all (maybe it's because I am somewhat ambidextrous). The frequency response certainly is in the ball park for a cassette machine and is nothing at all to question in light of the unit's low distortion and very favorable S/N ratio. A clean high end to 15,000 Hz is, to paraphrase our own report in the last issue, always preferable to a "dirty" high end beyond that mark.



Yamaha TC-800GL: Record/playback response, using TDK-KR-C60 tape (chrome).



Yamaha TC-800GL: Record/playback response, using Maxell UD-XL-C60 cassette tape (standard low-noise).

YAMAHA TC-800GL CASSETTE RECORDER Vital Statistics

PERFORMANCE CHARACTERISTIC	LAB MEASUREMENT
Using chrome tape:	
Record/playback frequency response, -20 dB	± 3 dB, 40 Hz to 15 kHz
Harmonic distortion, -10 VU (ref. 1 kHz)	
0 VU	
+3 VU	
S/N ratio, Dolby off	59 dB
Dolby on	67 dB
Using standard low-noise tape:	
Record/playback frequency response, -20 VU	± 3 dB, 30 Hz to 13,500 Hz
Harmonic distortion	
-10 VU	1.5%
0 VU	1.2%
+3 VU	1.3%
S/N ratio, Dolby off	56 dB
Dolby on	64 dB
Input sensitivity, microphone	0.5 mV
line level	41.0 mV
Output signal level, line	430.0 mV
headphone	1.0 mW/8 ohms
Flutter and wow (combined WRMS)	0.04%
Fast wind time, C-60 cassette	50 seconds

CIRCLE 48 ON READER SERVICE CARD



There's no place like home.

To get it together, and down on tape. Recording at home, working out ideas in private, at your own pace, gives you the freedom and control to help you get the music right. Your way.

With the TEAC 3340S 4-track multichannel recorder with Simul-sync, the Model 2 super flexible 6-in, 4-out mixer with pan and multiple patch points, the A-3300S2T half-track mastering recorder, the ME-Series of electret condenser mics, plus associated accessories... you have all the essential gear you need, at affordable prices, to set up your own multi-track recording rig.

It's more than a system...it's your access to the technology of music...it's the vehicle to make your inner musical perceptions audible reality. It works. And you can make it work for you.

Simply call (800) 447-4700* toll free for the name of your nearest TEAC retailer.

*In Illinois, call (800) 322-4400.

TEAC

The leader. Always has been.

TEAC CORPORATION OF AMERICA: 7733 Telegraph Road, Montebello, California 90640



GROOVE VIEWS

Reviewed by:

KEITH BADGER
SEDGWICK CLARK
NORMAN EISENBERG
BETH HISELER
H. G. LA TORRE
STEVEN R. MASTERS

POPULAR

AEROSMITH: *Toys in the Attic.* [Jack Douglas, producer; Jay Messina, engineer; recorded at The Record Plant, New York.] Columbia PC-33479.

Performance: **Good "live" feel**
Recording: **Bright**

I'm impressed with the latest from Aerosmith, *Toys in the Attic*. They offer ballsy, macho lyrics with the musicianship to back it up. Many groups who work themselves up into a visual lather to compensate for lousy musicianship fall flat on record.

Aerosmith is led by singer/songwriter Steve Tyler. His voice, though not exceptionally distinctive, is clear and his phrasing is easily understandable. Guitarists Joe Perry and Brad Whitford play off each other well, trading licks and taking leads. Ron Hamilton's bass lines are fine, but the tone is often too thin for the music. There should be more contrast with the crispness Joe Kramer gets on drums, especially cymbals.

For producer Jack Douglas, this is his second time out with the group, and he's put forth a good "live" feel. *Toys* is engineered well, with good separation and a high level. Most of the songs are above average, especially "Adam's Apple," "Walk This Way" and "Sweet Emotion."

The group runs into a little trouble on the slow cuts "Round and Round" and "You See Me Crying."

They simply don't have a mellow sound, and should perhaps employ another singer for prettier songs. Overall, though, a respectable album and well worth a listen.

K.B.

BLACK SABBATH: *Sabotage.* [Black Sabbath and Mike Butcher, producers; Mike Butcher and Robin Black, engineers; recorded at Morgan Studios, London and Brussels.] Warner Bros. B-2822.

Performance: **Tiring**
Recording: **Surprisingly clean**

Black Sabbath fans can rest easy—the group has not gone acoustic. In fact, *Sabotage* is the same form of distortion-rock that the boys are famous for. Their style is straight ahead metal music, and if you like past works by the group, you're in luck.

Eight months in the making, the album has their usual bad boy, satanic flavor, with "Megalomania" the most representative cut. To the group's credit, they wrote, arranged, performed and co-produced all the cuts. Production and engineering are compatible with the music: surprisingly, there are few unnecessary effects (other than constant echo on Ozzy's voice) and the mix is well-balanced.

The music, however, is tedious. They still play only one or occasionally two chord progressions (six albums later) and there's an absence of any musical imagination, particularly on drum fills. Black Sabbath has always been a poor man's Led Zeppelin, and still is.

K.B.

KING HARVEST: *King Harvest.* [Jeff Barry, producer; Earle Mankey and Steve Moffit, engineers; recorded at Brother Studio, Santa Monica, Cal.] A & M SP 4540.

Performance: **Consistent**
Recording: **Clean and accurate**

The Band once sang "... King Harvest will surely come." Well, they finally made it. The first A & M release by King Harvest spotlights the versatility of the band. Vocalist/bassist David "Doc" Robinson is equally comfortable on soft ballads as he is on good-time rockers reminiscent of their hit "Dancin' in the Moonlight." Tasteful harmonies and horn parts add to the overall happy feel of the music, which has elements of Poco, The Band, Van Morrison and other down-home country rock bands.

Producer Jeff Barry has stayed away from unnecessary gimmicks, studio effects and his usual over-commercial sound which could only cloud KH's clear instrumentation and vocals.

King Harvest is a very easy album to listen to. Sit back, relax and enjoy.

S.R.M.

PURE PRAIRIE LEAGUE: *Two Lane Highway.* [John Boylan, producer; Paul Grupp, engineer; recorded at Capitol Records.] RCA APLI-0933.

Performance: **Consistently fine**
Recording: **Vibrant**

Pure Prairie League continues to play fine electric country music—a

sunny combination of the strong rhythms and high energy of rock with the natural joy of bluegrass. The group comes from the musically rich southern Ohio and northern Kentucky areas, and has been together for four years with one major personnel change. Since its last album, *Bustin' Out*, lead singer, guitarist and songwriter Craig Fuller has gone solo, and with him went some of the compelling poetic quality found on the group's other albums. The lyrics on *Two Lane Highway* make easy, sometimes amusing listening, but they are not spectacular.

Fuller was the dominant force in Pure Prairie League; to the group's credit, its high quality has been maintained without him. The orchestration, instrumental work, vocals and recording are all excellent. John David Call joins Poco's Rusty Young as one of the few pedal steel guitarists who can make his instrument work outside a straight country idiom, and Chet Atkins adds some nice country guitar pickin'. The melodic vocals are rich and full without sounding cluttered and there is some fine guest harmony by Emmylou Harris.

The recording has a vibrant brilliance that is a combination of top-notch performing, solid engineering, appropriate production, and careful mastering and pressing. The result is an album with no dynamite cuts but worth having in your collection. B.H.

BRUCE SPRINGSTEEN: Born To Run. [Bruce Springsteen, Mike Appel, Jon Landau, producers; Jimmy Iovine, engineer (Louise Lahav, "Born To Run" only); recorded at Record Plant, N.Y.C. (914, Blauvelt, N.Y., "Born To Run" only).] Columbia PC 33795.

Performance: **Brilliant**
Recording: **Confused**

If the sound of the E-Street Band "live" is what the producers have been attempting to capture on vinyl, the beast continues to elude the hunter.

Born To Run, like the first two Springsteen albums, is an album on which talent overshadows the lack of studio expertise. This new album has taken months longer to complete than expected and is finished at last. But the production staff of Appel, Springsteen, and now Jon Landau still has many more months to go, regardless of improvements.

New listeners will love this release for the N.Y.C./N.J. street scenes presented. Other artists like Elliot Murphy, Billy Joel and Lou Reed have attempted to recreate such scenes, but none creates the images more vividly—the subways, alleys, short-lived romances, fast cars, seashore sweethearts, big risks by small-time operators.

To the veteran Springsteen listeners, however, the topics may be getting stale; prolific as he is, he continues to say the same things in different ways.

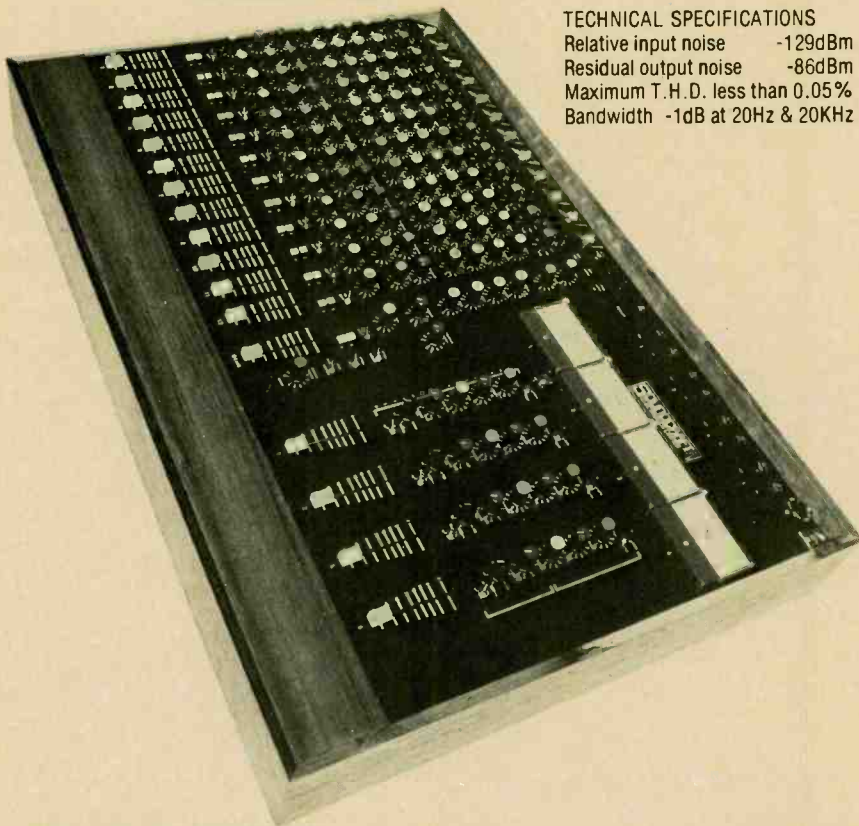
Nevertheless, he is such a huge talent that his fans needn't worry about paralysis setting in yet; the material still flows when necessary. Springsteen is just beginning his assault on the music world.

Bruce Springsteen's love for old rock 'n' roll is more obvious here than on the two previous albums. Enough has been written about the Springsteen production crew's attempt to emulate Phil Spector's "Wall of Sound" production techniques. Why

SOUND SENSE

From Soundcraft Electronics Ltd.

TWELVE BY FOUR



TECHNICAL SPECIFICATIONS

Relative input noise -129dBm
Residual output noise -86dBm
Maximum T.H.D. less than 0.05%
Bandwidth -1dB at 20Hz & 20KHz

TWELVE BY FOUR OFFERS:

12 input channels 4 mixing buses Complete stereo monitoring facilities
Echo and cue facilities for each input channel Soling facilities
4 band equalization on each channel

AVAILABLE FROM \$3450.00

EXCLUSIVELY DISTRIBUTED IN THE U.S.A. BY SYSTEMS & TECHNOLOGY IN MUSIC, INC.,
2025 FACTORY STREET, KALAMAZOO, MICHIGAN 49001 • [616] 382-6300

CIRCLE 17 ON READER SERVICE CARD

bother? The group is structured around a male vocalist/guitarist whose lyrics provide a major degree of the overall intensity. Such was not the case with Mr. Spector who had his greatest successes with female groups, mono mixes and simplistic if not inane lyrics which could be buried within a wall of sound. Essentially, it was the sound of a period, not of a lifetime. Springsteen cannot use those techniques indiscriminately. The magnificent "Rosalita" from the second album is the best example of a Springsteen number which warrants such methods. You don't care what he's singing about because you *already know* the moment the song starts. The majority of his material, however, does not fit into the same category.

The band never stops surprising the listener with its adeptness at playing almost all forms of music. Note the jazz-like interlude in "Jungleland," and the R & B feel on "10th Ave. Freeze Out" where Clarence Clemons leads a fine horn section of Randy Brecker on trumpet and Flugelhorn, his brother Michael on tenor sax and David Sanborn on baritone sax.

Promoters and station programmers will undoubtedly continue to la-

bel "Jungleland" a classic rock 'n' roll song and overplay "Born to Run," "She's the One" and "Thunder Road." But "Meeting Across the River" is a sleeper which should gain prominence as the definitive piece in this genre.

The wheels should be turning to get a "live" album out in a short time. If the engineers are topflight, with overdubbing and production minimal, it could be the last word in "live" albums for a long time to come.

It is amazing how solid a group can sound while engineers and producers are learning the trade at its expense. Unfortunate as the situation is, it all comes out as a back door compliment to the finest band in rock 'n' roll.

NOTE: A pleasant addition—much needed to enable Springsteen to perform comfortably on stage—is guitarist and vocalist Steven Van Zandt. Mr. Van Zandt, has previously played with Springsteen in not-so-notable New Jersey Shore bands, e.g., Dr. Zoom and the Sonic Boom and Steel Mill. Van Zandt appears on this album only as a background vocalist, having reentered the scene after most tracks had gone through the final remix stage. H.G.L.



Bruce Springsteen: assaulting the music world!

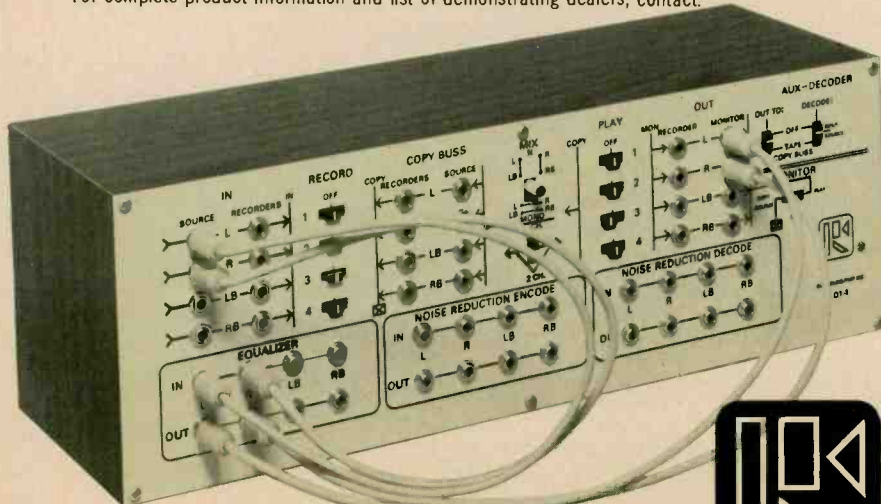
mix and patch like the Professionals

Russound's QT-1 audio control center and patchbay permits the tape monitor loop of your audio system to conveniently accommodate up to four tape recorders of quad, stereo or mono format in any combination, plus outboard noise reduction, equalizers, compressor/limiters, and SQ, QS, RM, and CD-4 decoder/demodulators. All accessories plug into phono jacks on the QT-1 rear panel (72 available) and are programmed from the front panel.

Use for recording, playback, dubbing and mixing down from tapes at the flip of a switch. Patch cords (12 furnished) permit convenient sound-on-sound, sound-with-sound, channel interchanging, and insertion of equalization, noise reduction, etc., anywhere in the audio chain and in any desired sequence.

The QT-1 is obsolescence-proof and provides professional studio type flexibility and convenience at an audiophile price of \$249.95.

For complete product information and list of demonstrating dealers, contact:



Russound/FMP, Inc.
Canal Street
North Berwick, Maine 03906



MICHAEL STANLEY BAND: *You Break It You Bought It.* [Bill Szymczyk, producer; Bill Szymczyk, Allen Blazek, Ed Marshal, engineers; recorded at Criteria.] Epic PE 33492.

Performance: **Professional**
Recording: **A +**

The Michael Stanley Band shines over a wide spectrum of original music. This is Stanley's third album and his third group—each hotter than the last. Producer/engineer Bill Szymczyk has been with Stanley all the way, and his influence is evident.

Bill's impeccable techniques have brought out the best from the likes of Joe Walsh (who played on earlier Stanley albums), J. Geils and the Eagles. His versatility gives each song its own sound without losing the essential continuity of the album.

The clean, quiet Eagles approach works well on "Step the Way" (good harmony blend), "Sweet Refrain" and "Waste a Little Time." The Geils/Walsh forcefulness lends flavor to "Lost in the Funhouse Again," "I'm Gonna Love You" (good running bass

and drums) and "Face the Music," the album's best cut. The production numbers "Where Have All the Clowns Gone" and "Song for My Children" showcase the Miami Strings, but they unfortunately can't compensate for the album's weakest material.

Don't get the impression that the Michael Stanley Band is merely an extension of Bill Szymczyk's talent. All songs were written by Michael Stanley or Jonah Kosler, and the music has a 60's-like happy attitude. They could use an additional singer and a flashier drummer for future projects, but this album is a cut above most and well worth hearing. K.B.

MARSHALL TUCKER BAND: *Searchin' for a Rainbow*. [Paul Hornsby, producer; Kurt Kinzel, engineer; recorded at Capricorn Studios, Macon, Ga. ("Can't You See" at Wally Heider's Mobile Unit).] Capricorn CP 0161.

Performance: **Slow, but sure**
Recording: **Noiseless, crisp vocals**

The Marshall Tucker Band has developed into one of the finest country/blues groups in music today. The group has the ability to knock you out musically without tiring you out mentally. *Searchin' for a Rainbow* may not contain anything the equal of "This Ol' Cowboy" or "In My Own Way" but it does reemphasize MT's strong-point: consistency.

There's a lot of talent spread throughout MT and their contributing friends, but three individuals stand out: Toy Caldwell, Doug Gray and Paul Hornsby. Caldwell continues to write most of the material and play excellent, if not innovative, guitar. His songs, neither exceptionally different nor intricate, are mostly blues and country middle-of-the-road, but so believable that they don't come off.

This is largely due to vocalist Doug Gray whose voice combines a Greg Allman/Johnny Winter rawness with the melodic quality of Kenny Loggins or Richey Furay. Producer Paul Hornsby has been with MT on all four albums and also sits in on keyboards. He maintains a precise, even balance, and uses the guest artists well.

Recently, there's been a tendency to stack a lot of well-known guest artists on an album, more for a sales gimmick than for musical contributions. This is not the case here; MT can stand alone as a solid six-piece group, but they tour and jam regularly with their guests. Marshall Tucker may still be "Searchin' for a Rainbow," but the colors are already there. They just seem to keep getting brighter. K.B.

JETHRO TULL: *Minstrel In The Gallery*. [Ian Anderson, producer; Robin Black, engineer; recorded at Maison Rouge mobile studio.] Chrysalis CHR-1082.

Performance: **Consistent**
Recording: **Good definition**

Jethro Tull has already proven itself in the recording studio, and *Minstrel In The Gallery* is no exception. Among its long list of concept albums, *Minstrel* is somewhat lighter than previous releases, but it can still move you.

GO PROFESSIONAL!

Go Otari MX-5050

Otari's new MX-5050 is a compact professional recorder that's scaled down in size but not in performance or features. Make no mistake. The Otari MX-5050 is not another hi-fi recorder. Instead, it's a creative working tool for the professional recording engineer.

The MX-5050 is designed to handle a wide spectrum of professional recording and production assignments: audiovisuals, broadcast programming, rock groups, high school and college bands, church and religious recording, drama classes, and local theater groups.

Look at the professional recording features the Otari MX-5050 has to offer: two or four channels, front panel edit and cue, precision mounted splicing block on head cover, synchronous reproduce for over-dubbing, motion sense to prevent tape damage, XL connectors, 600 ohm + 4dB output, balanced line transformers, built-in mic preamps, extra reproduce head (1/4 or 1/2 track) on two channel version, plus much more.

Go professional. Go Otari.

OTARI

Otari Corporation
981 Industrial Road
San Carlos, Calif. 94070
(415) 593-1648
In Canada: Noresco Mfg.,
Toronto



CIRCLE 41 ON READER SERVICE CARD

Recorded in a mobile studio, the album suffers no loss of quality. Each instrument is in its place; drum panning is accurate and echo and reverb are used effectively for vocal and flute tracks.

Ian Anderson seems to have endless creative energy. On this project, his duties include lead vocals, acoustic guitar, flute, and nearly all of the writing and production. Ian is one of the few musician/producers who can handle both roles well.

In "Baker St. Muse" there is a full orchestral arrangement which provides musical contrast with the driving bass and piercing guitar. *Minstrel's* only problem is that it just doesn't take you anywhere the group hasn't taken you before. Everything is played, produced and engineered well, but even after a couple of listenings, it becomes anti-climactic. To quote from one of the cuts, "Requiem": "Here I go again, it's the same old story."

K.B.

JAZZ

EARL HINES: *Another Monday Date.*
Prestige/P 24043.

Performance: **Sparkling**
Recording: **Superb remastering**

Earl Hines has probably had a greater influence on jazz pianists than Steinway, Baldwin and Wurlitzer combined.

Issued last year, this "two-fer" from the Fantasy/Prestige label is a gem. It includes two sides of selections featuring Hines in a group setting with Eddie Duran on guitar, Earl Watkins on the drums and Dean Reilly on bass. The sets show Hines making Fats Waller standards even more brilliant by adding his saucy, ringing style to a number of compositions, including "Squeeze Me" and "Ain't Misbehavin'."

Featured on sides three and four is Hines playing solo piano, a setting in which many feel the "Fatha" is at his best. On these sides, one really hears his tireless, amazingly innovative style—never halting even when changing rhythm or direction.

The remastering of the original re-

Two Stunning New Recordings from Dizzy Gillespie

by Nat Hentoff

The art of music also involves, of course, the art of survival. In jazz, survival is more hazardous than in any other jousting ground of serious music. It is not only that there are always new challengers, nurtured by the very forebearers they are now trying to outdate. There is also the chronic likelihood that the very language of the music can change radically within a generation. When Ornette Coleman first came to New York, some older players were listening to him in fear. "If he's not jiving," one of them said to me, "I'm through. I don't understand what he's doing."

Yet here is John Birks "Dizzy" Gillespie who has not only buoyantly survived but at the age of 58, in two stunning new recordings, proves that he is far and away the most powerfully original as well as the most technically accomplished trumpet player in all of jazz, including the farthest reaches of the avant-garde.

Strangely, there had been relatively few new Gillespie recordings in ten or more years until Norman Granz became a record producer again with his Pablo label (distributed here by RCA Victor). Granz came back just in time because no one else in the recording industry has his unyielding fervor for recording the classic middle-aged and older jazzmen while they still have a lot to say—and to hell with whether the albums make the charts or not.

Granz, who was not especially sound-conscious in his previous manifestation as a recording impresario (on Verve and Allied lines), now appears to have set himself consistent and high standards of sound quality. His sets, whether recorded in London or in Los Angeles, are characterized by a clean, crisp ambience in which, the way I hear it, neither the individual musicians nor the ensemble as a

whole are overmiked. It's like being in a "live" living room rather than inside an engineer's head.

The two key Gillespie sets on Pablo so far are *Dizzy Gillespie's Big 4* and *Oscar Peterson & Dizzy Gillespie*. On both, Dizzy's prodigious technique, which sometimes was used more for stunt-flying than for music, is under firm discipline. As a result, his quite astonishing fecundity of ideas is shaped into tautly cohesive improvisatory structures that are even more absorbing than his blazing path-finding of the '40's and early '50's. The fire, and often the mocking fun, are still present; but there's also much mellowness in his tone as well as in the turns his inventiveness takes. This is a musician at the apex of his career—swinging deep and joyously, subtly illuminating blues and ballads with a freshness of conception that, so far, trumpeters 30 years younger have yet to match.

On the *Big 4* set, Gillespie is resiliently complemented by bassist Ray Brown, drummer Mickey Roker, and the impressively wide-ranging guitarist Joe Pass (whom Granz is assiduously making into an internationally renowned recording star). An unexpected dividend in *Oscar Peterson & Dizzy Gillespie* (there are no other players) is that the force of Gillespie's insistently organic musicianship shakes Peterson from his usual keyboard calisthenics and turns him into what he has seldom been before on records—an authentic musician with a lyrical imaginative sweep and the ability, of all things, to sometimes play only 12 notes when he could have fitted in 43. And that's what Dizzy has particularly learned through, the years—space can work wonders.

DIZZY GILLESPIE: *Dizzy Gillespie's Big 4* [Norman Granz, producer]. Pablo 2310 719.

DIZZY GILLESPIE: *Oscar Peterson & Dizzy Gillespie* [Norman Granz, producer; recorded at Advision Studios, London]. Pablo 2310 740.

leases is superb, as is usually the case when Fantasy/Prestige undertakes a project like this.

From start to finish, this is a sparkling album for Earl "Fatha" Hines fans and for jazz piano fans in general.
H.G.L.

DAVID SANBORN: *Taking Off.* [John Court, producer; Don Hahn, engineer; recorded at A & R Studios, N.Y.C.] Warner Bros. BS 2873.

Performance: **Solid, but undisciplined**
Recording: **Exemplary**

David Sanborn seems to have done sessions with more musicians than are listed in the Schwann catalogue.

His solo album, *Taking Off*, is a good mixture of tunes that shows him off in good style. Sanborn plays varied types of music very capably, although he is somewhat lacking in discipline. Some of his solos have the tendency to resolve into screeching high notes, thus aborting what had begun as an apparently well-thought-out phrase. Sanborn's strength lies in snaking in and out of the basic horn lines and then laying back in at the end of a passage in time to add power to the entire horn section.

Any time instruments other than basic rhythm instruments—bass, drums, piano or guitar—are recorded, the demands on all involved become significantly greater. Those demands are met on this recording. The horns are cleanly recorded, have good punch and yet are not overpowering. There's no clacking of saxophone keys frequently found on horn-oriented albums. Also, the recording of the drum tracks on this album are some of the best heard in a great while. Listen especially for the two separate drum tracks on Steve Khan's "Butter Fat" and "Duck Ankles" employed in order to provide a fuller sound.

Surely much of the good work is due to the production of John Court, who has had much experience with rock 'n' horn music. Court was responsible for the production work on the original Electric Flag album, an album which still stands miles ahead of anything else to have been recorded in the field.

This work will stand as one of the best produced and engineered albums this year. Its commercial success will probably be limited; nevertheless it is a prize.
H.G.L.



HAIL HEIL!

When you need that big distortion free sound system. HEIL just introduced new mixers from \$195.00, stereo power amplifiers for \$250.00 and club PA's for less than \$600.00! Ask your local pro dealer or write Dept. Q for our new catalog.

HEIL AUDIO

#2 HEIL INDUSTRIAL BLVD.
MARISSA, ILL. 62257

CIRCLE 38 ON READER SERVICE CARD

Not all stereo cassette machines are created equal.

The Uher CG-360 has so many features and such outstanding performance specifications, that it makes other machines obsolete. It also comes closest to challenging professional open-reel machines, while still offering the ease of cassette operation.

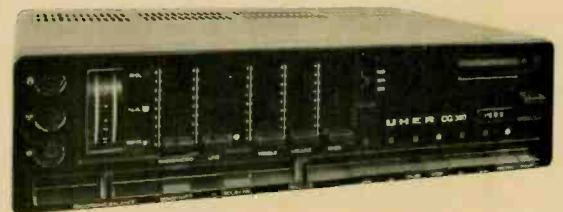
Talk of convenience, you have it with the world's first front loader, along with three ways to play back with an automatic selection system. It's also the first recorder with fully computerized digital logic controls and a Dolby IC Noise Reduction System for quiet operation.

Consider, too, the low wow and flutter of the CG-360 and frequency response from 20 to 20,000 Hz \pm 3dB with chrome tape.

We invite you to visit your Uher dealer or write to us for complete details.

UHER

Uher of America, Inc.
621 S. Hindry Avenue
Inglewood, CA 90301
(213) 649-3272



CIRCLE 56 ON READER SERVICE CARD

the
incredible
cassette
machine.

The Unique Film Music of Bernard Herrmann

by Howard Roller

Nearly every movie composer of Hollywood's Golden Years is being revived in the current obsession with nostalgia. The Waxmans, Roszas, Korngolds, Tiomkins, Newmans and Steiners cascade upon the record buyer ad nauseam. Amid all these stands Bernard Herrmann, a man unique among movie composers.

With the possible exception of Aaron Copland, whose film music is merely an adjunct to his career, none of the other film composers seem able to write music that retains its individuality, yet is an integral part of the film it accompanies.

There is an unbroken line of taste, talent and style from his brooding music for Orson Welles's *Citizen Kane* and *The Magnificent Ambersons* through his mood pieces for Twentieth-Century Fox's *Hangover Square* and *Jane Eyre*, and from fantasy films such as *The Day the Earth Stood Still*, *The Seventh Voyage of Sinbad* and *Journey to the Center of the Earth* to the superb culmination of his talents in seven Hitchcock films and two Truffaut films. Herrmann instinctively knows the proper style for a particular film, be it 18th century England (*Three Worlds of Gulliver*) or Bradbury's tormented future (*Fahrenheit 451*).

Fortunately, the record companies appear to have recognized Herrmann's stature, responding admirably for the most part. The recordings fall into three general categories: (1) the Welles and Fox films, (2) science fiction and fantasy, and (3) Herrmann's work with Hitchcock.

All of the discs are omnibus collections except one: a recent United Artists release with Leroy Holmes and his Orchestra of the music from *Citizen Kane*—a disaster from start to finish. From its dull, lifeless playing to the abominable record surfaces, this one is a total dud. Avoid it. Apparently Herrmann wishes to record a

complete *Kane* himself. I hope so, for the task remains to be done adequately.

Of the other three discs containing *Kane* excerpts, two are virtual duplications: one is an import on Unicorn and the other is a London Phase 4 recording. Four of the seven Herrmann issues are Phase 4 discs conducted by the composer. Technically, they are sonically overwhelming—perhaps too much so. I prefer the Unicorn disc for the *Kane* and *Ambersons* music, although audiophiles will probably desire all the Phase 4 issues—they really are deafening.

The remaining *Kane* disc is the RCA release—my personal choice as the most satisfying of all seven records. It contains the music from *Salambo* (the opera in *Kane*), not previously recorded even on the detestable UA disc. It also has the *Hangover Square* Concerto—a must for Herrmann fans. It is spaciouly but not disturbingly recorded. This is the one to have.

Of the remaining three discs, two are science fiction and fantasy scores and all are Phase 4 recordings. In the realm of sci-fi, Herrmann wears a bit thin. The various scores tend to blur in the mind and suggest a Herrmann Science Fiction Formula. Still, there are bright spots. The scores for *Fahrenheit 451*, *Journey to the Center of the Earth* and *Three Worlds of Gulliver* are interesting, even if those of *The Day the Earth Stood Still*, *Mysterious Island*, *Seventh Voyage of Sinbad* and *Jason and the Argonauts* are less so. In these two discs, Phase 4 sonic gimmickry is somewhat more appropriate, but the music largely a matter of taste.

Finally, there is the one disc of Hitchcock film music. This Phase 4 recording, first issued about five years ago, contains snippets of five scores. The *Vertigo* original soundtrack was once available, but has been deleted for several years. At least two of the scores, *Psycho* and *Vertigo* deserve complete new treatments. [*Psycho* will soon be recorded in England under the composer's direction for Unicorn—Ed.] With all the Herrmann now available, his work with Hitchcock, arguably his best music, remains scarcely touched. Hopefully, this will be rectified in the near future.

HERRMANN: *Welles Raises Kane; Devil and Daniel Webster.* London Philharmonic Orchestra, Bernard Herrmann cond. Unicorn UNS 237.

HERRMANN: *Music from The Great Movie Thrillers* (excerpts from *Psycho*, *Marnie*, *North by Northwest*, *Vertigo*, *The Trouble with Harry*). London Philharmonic Orchestra, Bernard Herrmann cond. [Tony D'Amato, producer; Arthur Lilley, engineer.] London Phase 4 SP 44126.

HERRMANN: *Music from Great Film Classics* (excerpts from *Citizen Kane*, *Devil and Daniel Webster*, *Jane Eyre*, *Snows of Kilimanjaro*). London Philharmonic Orchestra, Bernard Herrmann cond. [Tony D'Amato and Gavin Barrett, producers; Arthur Bannister, engineer.] London Phase 4 SP 44144.

HERRMANN: *The Fantasy World of Bernard Herrmann* (excerpts from *Journey to the Center of the Earth*, *Seventh Voyage of Sinbad*, *The Day the Earth Stood Still*, *Fahrenheit 451*). National Philharmonic Orchestra, Bernard Herrmann cond. [Raymond Few, producer; Arthur Lilley, engineer.] London Phase 4 SP 44207.

HERRMANN: *Citizen Kane* (excerpts from *Citizen Kane*, *On Dangerous Ground*, *Hangover Square*, *Beneath the 12-Mile Reef*, *White Witch Doctor*). National Philharmonic Orchestra, Charles Gerhardt cond. [George Korngold, producer; K.E. Wilkinson, engineer.] RCA ARL 1-0707.

HERRMANN: *Citizen Kane* ("Original Motion Picture Score"). Leroy Holmes and His Orchestra. [John Timperley, John Isles, Dave Richards, Chris Stone, engineers.] United Artists LA 372-G.

HERRMANN: *The Mysterious Film World of Bernard Herrmann* (excerpts from *Jason & the Argonauts*, *Mysterious Island*, *Three Worlds of Gulliver*). [Tim McDonald, producer; Arthur Lilley, engineer; recorded at Kingsway Hall, London.] London Phase 4 SPC 21137.

JOHNNY "GUITAR" WATSON: *I Don't Want to be Alone Stranger.* [Johnny Watson, producer; Jim Stearn, engineer; recorded at Fantasy Studios, Berkeley, Cal.] Fantasy F 9484.

Performance: **Grey flannel**
Recording: **What-of-it?**

Here's an album that reminds you of a grey flannel suit. It has no distinguishing features. The best thing is the cover photo of Watson sitting with a young lady in an all-white convertible while outfitted in a costume that could have only been designed by that master of dress, Bo Diddley.

Almost everything on this album is uninspiring. Many of the hip witticisms thrown into each vocal track could just as easily have been left out. "You Can Stay, But the Noise Must Go," the story of a landlord not enamored of loud blues music, does raise a smile. "I Don't Want to Be a Lone Ranger" and "It's Way Too Late" almost save the album, but there is simply too much here to try to save or perhaps not enough to warrant the attempt. H.G.L.

tion that carries drama and dynamic tension to heights I never have heard before in any performance of the Fifth. There is a sense of discovery here, combined with a passion and a new insight into the inner fabric of the work, its rhythms, its tonalities, its sonic color, its relentless drive.

One could say something similar about the playing of the Vienna Philharmonic—I have heard this orchestra many times before and always admired it, but on this recording the players seem to break all bounds and manage to produce some of the most gorgeous orchestral sound ever taken down on tape. All told, this is possibly the greatest recording of the Beethoven Fifth extant today. The cassette sound is impeccable and truly "state of the art." N.E.

IVES: *String Quartet Nos. 1 & 2.* Concord String Quartet. [Musical production, engineering & tape editing, Marc J. Aubort, Joanna Nickrenz (Elite Recordings, Inc.).] Nonesuch H-71306.

Performance: **The best**
Recording: **Astonishingly realistic**

I cannot remember the last time I listened to such a perfect disc! This is the record for anyone wishing to discover Charles Ives in either of his Jekyll-Hyde guises. And even those surfeited from the 1974 Ives centenary will be bowled over by this one.

The First Quartet is Ives spinning out hymns, popular and patriotic tunes and occasional personal inspirations in a warm, Dvorakian glow, while the Second finds Ives the Iconoclast revelling in dissonant constructions and hilariously thorny "arguments" between the traditionally placid string foursome. In the second movement, the second violin is instructed to play music marked *Andante emasculata* and *Largo sweetota*, only to be violently interrupted by the other players (*Allegro con fisto*).

The recording is simply the most realistic of a string quartet I have ever heard; comparison with the finely played and recorded 1968 Juilliard version on Columbia is amazingly telling. Nonesuch's surfaces are excellent and the notes by Robert P. Morgan are alone worth the price of the record. Altogether, one of the Great Bargains at any price. S.C.

CLASSICAL

BEETHOVEN: *Symphony No. 5.* Vienna Philharmonic, Carlos Kleiber cond. [Werner Mayer, producer; Hans Peter Schweigmann, engineer; recorded in the Grosser Musikvereinsall, Vienna.] DG 3300 472 (Dolbyized cassette).

Performance: **The greatest**
Recording: **Superb**

It may be that the rich lodes to be mined from this work are inexhaustible and this may explain at least in part why even a competent reading of the Beethoven Fifth cannot bore, even after having heard the work dozens of times before.

More important this time, however, must be the exuberant, sheer glorious spirit with which Kleiber imbues it—a spirit that is rivaled by an astonishing precision, a carefully built presenta-



SMALL STONE THE STATE OF THE ART PHASE SHIFTER

The most advanced Mini-Phaser available anywhere! Exclusive "Color" switch transforms the mellow, rolling, full-bodied milky phasing to the sweeping swooshy phasing made famous on early Jimi Hendrix recordings, and previously only available on special studio equipment. Rate dial sets the speed of the shift, from a slow swelling to vibrant warble. The Small Stone is highly efficient, having the lowest battery power drain of any popular phaser. Also, it's the first AC/DC unit available. Plug a 9V. battery eliminator into the jack and you run on AC only. Low noise, high quality, and fantastic effects make this a necessary addition to any guitar or keyboard. Comes with a battery.



Buy the Small Stone using the coupon below and try it!!! If it's not the greatest phase shifter you've ever heard, return it to us within 10 days for a full refund!!! Or if you want to save some money check your local music stores. Many leading music stores have the Small Stone on special sale now for less than \$49.00.

.....
electro-harmonix MR-1

27 West 23rd Street, New York, N.Y. 10010

Please ship: Postage paid by Electro-Harmonix.

**Small Stone
Phase Shifter \$79.95**

Enclosed is a total check for order

Please place me on your new product announcement mailing list at no charge.

Name _____

Address _____

City _____

State _____ Zip _____

CIRCLE 52 ON READER SERVICE CARD

DG's Prestige Box Cassette Series —A Sampling

by Norman Eisenberg

About seven years ago, when many of us were still regarding the cassette format as an oddity with some promise for the audio-minded, Deutsche Grammophon took the lead among the major labels and issued a whole slew of cassettes containing some of their best repertoire and most esteemed performers. And those cassettes, too, were the best-packaged of their breed, supplied in fairly sturdy plastic boxes that hinged open and contained program notes. If this seems fairly commonplace now, it should be recalled that other cassettes at the time were often casually packaged and did not even always inform you of who was playing the music.

The new Prestige Box series carries the DG faith in this medium some steps along by offering complete versions of multi-album works in a new packaging that looks like a somewhat scaled-down version of a multi-disc set. Each one opens like a book to reveal the cassettes (still in their individual swing-open plastic housings) fastened to the right inside cover, while a pocket on the left inside cover holds a removable booklet containing program information.

In the case of a three-cassette set, the cassettes lie horizontally; for a two-cassette version they lie vertically. The result is that both "boxes" are of the same height and so may be stored neatly as if they were disc albums, and indeed the height of a Prestige Box makes it suited for standing alongside disc albums. If DG thus has done nothing else than to solve the storage problem of cassettes, they would merit kudos.

But handsome is as handsome does, or—in the case of audio products—as handsome sounds, and judging from the three Prestige Boxes I have sampled, DG is assured of a lead in the cassette field on the basis of the acoustic merit evident in so many major musical releases.

One might expect that something like a Dolbyized tape version of the Berlioz *Damnation de Faust*—recorded only about two years

ago—would understandably sound great, but how to explain the sonic excitement of five Beethoven concertos, even in a Dolby reprocessing, that were taped originally in June and July 1961? Is it the magic of Kempff's playing, of his utter mastery of the music and of his instrument that transcends thirteen years of progress in the recording art, or is it that the original masters were so good to begin with that they can produce, more than a decade later, first-rate copies that sparkle with life? Probably both explanations apply.

There is no indication in DG's notes that the Verdi work was Dolbyized, although we have been advised that the letters "DP" on the cassette stand for "Dolby Process." Be that as it may, with the Dolby switch off during playback, you can hear background hiss especially during quiet passages. Switching the Dolby on does indeed eliminate the hiss, but it also reduces some of the highs. Occasionally, the upper reaches of Ghiaurov's fine bass voice sound grainy, and the full orchestra sometimes becomes muffled when supporting the chorus. Despite these intermittent flaws, this is still an impressive cassette; the performance generates the kind of power a group can muster when they know they are doing something right.

BERLIOZ: *Le Damnation de Faust.* Edith Mathis, Stuart Burrows, Donald McIntyre, Thomas Paul; Tanglewood Festival Chorus and Boston Symphony Orchestra, Seiji Ozawa cond. [Thomas Mowrey, producer; Klaus Hiemann, engineer; recorded in Symphony Hall, Boston.] DG 3371 016 (Dolbyized cassette).

BEETHOVEN: *The Five Piano Concertos.* Wilhelm Kempff, piano; Berlin Philharmonic, Ferdinand Leitner cond. [Otto Gerdes, producer; F.C. Wolf, engineer; recorded in the UFA Studio, Berlin.] DG 3371 010 (Dolbyized cassette).

VERDI: *Requiem.* Mirella Freni, Christa Ludwig, Carlo Cossutta, Nicolai Ghiaurov; Wiener Singverein and Berlin Philharmonic, Herbert von Karajan cond. [Dr. Hans Hirsch, producer; Guenter Hermanns, engineer; recorded in Jesus Christus Kirche, Berlin.] DG 3370 002 (Dolbyized cassette).

Modern Recording CLASSIFIED Buy . . . Sell . . . Trade

- Products
- Equipment
- Services

Classified Rates:
60c per word

Minimum 10 words. Copy must be received at Modern Recording, 15 Columbus Circle, New York, N.Y. 10023 by the 1st day of the 2nd month prior to cover date (for example, the Dec/Jan issue closes October 1st). Payment must accompany order. Phone numbers count as 1 word. Zip codes are free.

Display Advertising:
\$80.00 per column inch

DON'T PEEK

Below is the solution to a crossword that you will find on page 72. Have you read this issue thoroughly? Twenty questions relate to either music, recording or a technical matter. And eight of the questions directly involve MR articles.

S	E	X	S	S	E	S	D	S	W
G	N	I	B	D	S	R	E	S	P
N	O	A	D	O	R	D	O	O	R
I	C	H	G	N	F	C	L	E	C
G	R	P	X	E	A	K	A	E	L
N	P	A	N	O	B	O	G	A	R
O	R	T	R	E	S	I	S	D	N
P	G	L	A	B	A	Z	A	L	O
G	E	W	I	C	S	I	H	P	G
N	L	N	K	I	L	M	D	N	A
I	L	E	I	G	N	A	R	A	I
T	P	N	O	S	I	O	N	F	D

RAVEL: Orchestral Works. Minnesota Orchestra, Stanislaw Skrowaczewski cond. [Joanna Nickrenz & Marc J. Aubort, musical supervision; Elite Recordings, engineering; recorded in Orchestra Hall, Minneapolis.] Vox QSVBX 5133.

Performance: **Peerless**
Recording: **Distant, but awesome**

This is the finest Ravel conducting I have ever heard on record or in concert—perhaps the most treasurable Vox Box ever released and an incredible bargain. Oh, sure, one can find a few works that other conductors do as well—and even some which surpass Skrowaczewski's elegant, dynamic readings. But his straightforward, rhythmically clean and texturally transparent performances are consistently on a high plane that no other conductor on record can match.

Notable performances are an extremely broad, languorous *Bolero* that times out to over 17 minutes, a *La Valse* with wonderfully sinuous string portamento, a broad, delicately sen-



Maestro Stanislaw Skrowaczewski: a peerless Ravel conductor.

suous *Ma Mere l'Oye*, a lithe and lively *Tombeau de Couperin*, an atmospheric *Rapsodie espagnole*, a lush, strongly characterized *Valses nobles et sentimentales*, a buoyant *Menuet antique* and an evocative *Une Barque sur l'océan*. Really, the only disappointment in this set is that *Daphnis* was not done complete; had it been, odds are that it would have joined Ansermet, Monteux and Munch in the top echelon of the work's performances.

The sound is rather controversial, judging from reviews and letters already printed in *High Fidelity* and *Stereo Review*. It is quite distant—and I must admit that I would prefer a closer balance—but very solid in its impact. True, details that one is accustomed to hearing in most of today's multi-miked monsters is occasionally missing, but the awesome realism of this pick-up is quite overwhelming. The vantage point is that of the balcony, which is perhaps why the conductor's marvelous control of dynamics is even more impressive. *Rapsodie espagnole*, *La Valse* and *Bolero* each begin so quietly that the music eases into the listener's consciousness, while the loud portions at the end are shattering in their power and impact.

The playing of the orchestra is excellent, and details are superbly articulated. Maestro Skrowaczewski has obviously considered every bar of Ravel's craftsmanship and his orchestra is able to deliver with an ease and virtuosity which never calls attention to itself.

Surfaces were none too good, but Richard Freed's commendable booklet of notes almost pacified me. S.C.

SIBELIUS: Symphony Nos. 5 and 7. Boston Symphony Orchestra, Colin Davis, cond. [Vittorio Negri, producer; recorded in Symphony Hall, Boston.] Philips 6500.959.

Performance: **Structured and poetic**
Recording: **Colorful and grand**

I must confess that I am a fan of Colin Davis. I have never heard a performance under his baton that was not for me a consummate experience of building up of a musical statement, of a canny sense of pacing, and of a kind of controlled (sometimes perhaps "cool") drive—if, on occasion, at the expense of realizing, or of exploiting, the full tonal values inherent in a score (something at which there is no one as adept, by the way, as Ormandy).

In these two Sibelius recordings, however, Davis pulls all the stops and the BSO responds accordingly to produce stupendous, exciting music. Tonal color there is aplenty—enough to challenge the frequency and dynamic range of any woofer/tweeter combination—but there also is poetry, sadness, exuberance and, especially in the last movement of the Fifth, an impelling grandeur that never palls. Quiet, clean surfaces are in the best Philips tradition. N.E.



Introducing: The Studio Designer

Cooper Audio

P.O. Box 883
Hollywood, Calif. 90068

MUSICROSS

ACROSS

1. acoustical consistency
8. "common sense" author; abbr.
10. Ohms law, E = ____
11. A Butler's question; 2 wds; var.
12. Romanian monetary unit; pl.
13. "holst-less" organization; abbr.
14. doc
15. drying oven
16. cathartic
19. million; prefix
20. Stevie Wonder's personal eng., Gary ____
21. 14A could be this
22. attenuate sibllance; abbr; var.
23. to make your ma a conductor, add ____
25. ____ & ____ man: record co. exec.
27. portable sound isolator
29. kind of pot
30. baffling situation (problem)
33. __, __, __, __; film ratings
34. musical sign
35. no good; abbr.
37. ____ Coltrane
38. early tape recorder financier
39. toward the mouth
41. switch designation
42. Ford's job
43. Sel-Syncing: over-____
44. Plural of 14A.
45. David ____
46. A ____; eng. assoc.

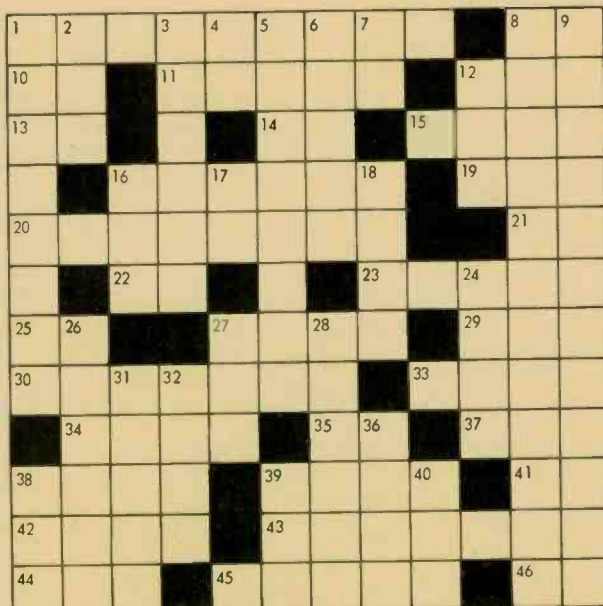


DOWN

1. best type of splice
2. ____ Tucker, Stevie Wonder's publicity manager
3. pleasure bikes?; 2 wds; abbr.; var.
4. you are; abbr.
5. Mr. Davls, Jr.'s life story; 2 wds., abbr.
6. type of ink
7. oh gee!
8. wire recorder ancestor
9. "bouncings"; 2 wds.
12. prevents signal peaks; abbr.
16. attenuator
17. Stones get some of these out; var., singular
18. lane or award
24. tent & cola: ____ & ____; abbr.
26. sync signal source: ____ head
27. you'll be 'Fonda' these letters
28. a watch company
31. medical purgative
32. sneakers
36. welcome back, Kaplan
38. record speed; abbr.
39. Sel-Syncs or too much dope
40. could be used on FM, too

Answer on page 70.

By Don Casale



Letters to the Editor

Putting It All Together

I have just received the first issue of *Modern Recording* and I am pleased and grateful. It exceeds the expectations I had developed several months ago upon sending in my charter subscription.

I am an electronic technology-turned-electrical engineering - student - and - aspiring - recordist. I'll solve differential equations all day long but I still want to know where to place that microphone and how to build my basement studio.

Many audio trade publications assume a lot of prior practical and technical knowledge which I don't have (yet!). Subsequently, they are written for more advanced and already knowledgeable audio/recording engineers. On the other hand, since all consumers are not recordists, consumer publications don't sufficiently cover the techniques, methods, etc. of modern recording (no pun intended). This has left a gap that needed filling, and you have accomplished this task well.

Judging by readers' questions in "Talkback," there are many others with insufficient and/or hybrid experience such as mine. The breadth of information you communicate in "Talkback," as well as articles, reviews, advertising (and hopefully your forthcoming classified ads) is invaluable to our "putting it all together." so to speak. Your publication should prove to be an important step in our collective educational experience.

In William Dana Orcutt's biography of Wallace Clement Sabine he wrote "What Morse did for the Telegraph, What Edison did for the Electric Light, What Alexander Bell did for the Telephone, What Marconi did for the Wireless—Sabine did for the Science of Acoustics." I am certain you will continue to do as much for the Modern Recordist.

Bruce E. Henrickson
Colorado Springs, Colo.

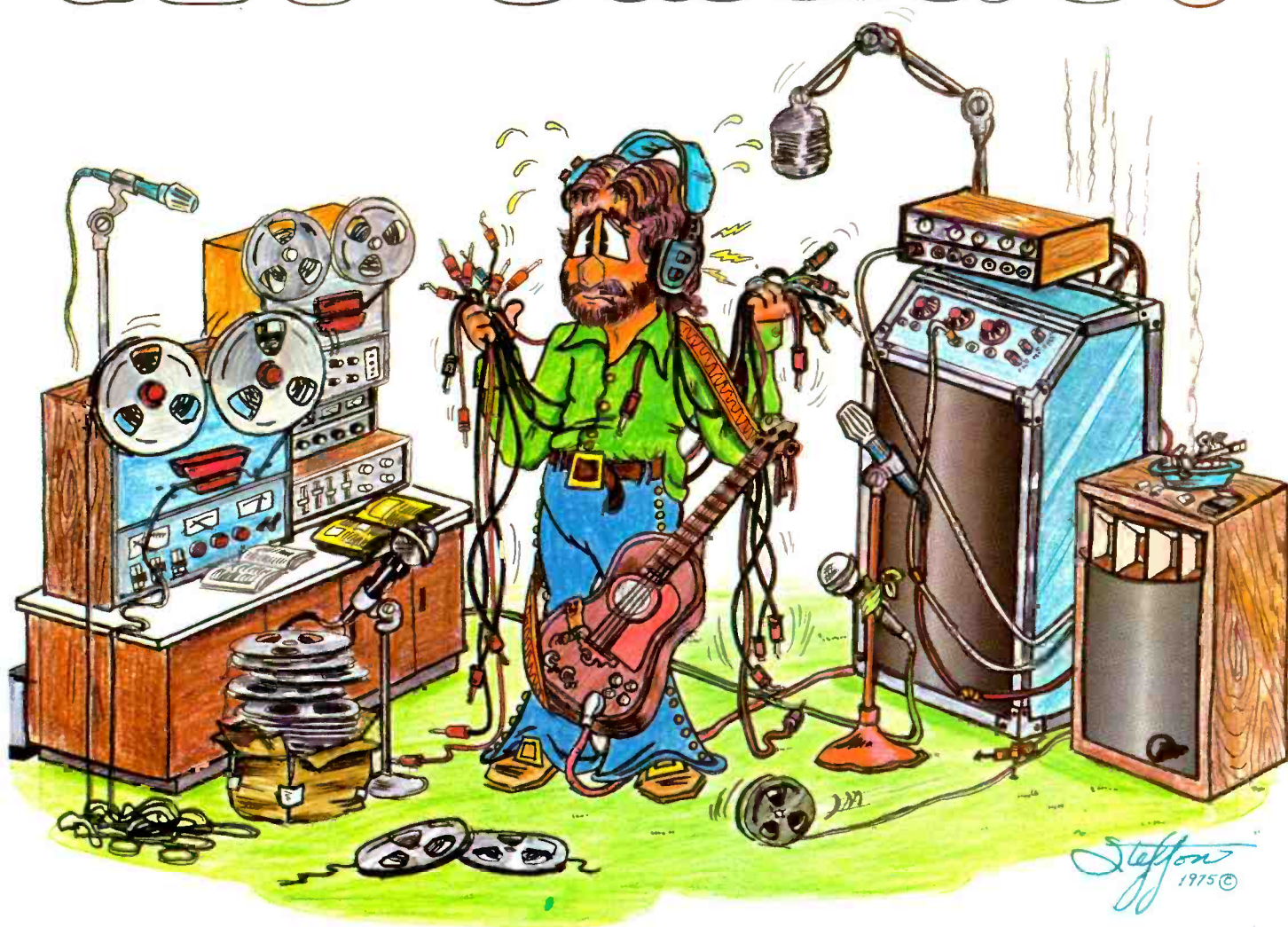
An Article Suggestion

Will you please run an article on tape deck maintenance and adjustment. I understand certain routine checks and adjustments are made before proceeding with an important recording session. Give us in detail tools (if any), test equipment and procedures. My Metrotech is supposedly adjustable in all parameters but I don't know how to test nor how to adjust nor what equipment I should buy. Am I asking too much? [No.—Ed.]

N.T. Dibbs
Brooklyn, N.Y.

P.S. Mechanically, I know some things, but electronically I'm pretty much at a loss. Enjoyed your first issue much.

GET SMART!



Call Toll FREE: (800) 421-0550*

ria RECORDING INSTITUTE OF AMERICA, INC.

... OFFERS ON-LOCATION MULTI-TRACK MODERN RECORDING
TECHNIQUES COURSES AT A 16-TRACK STUDIO IN YOUR CITY...

*IN: NEW YORK, MONTREAL & TORONTO, Call Collect (212) 582-0400

*IN: CALIFORNIA, Call Collect (213) 469-6333

*OR CALL OUR LOCAL REPRESENTATIVES IN THE FOLLOWING CITIES:

BOSTON, MASS.
Intermedia Sound
(617) 267-2440

NEW HAVEN, CT.
Troed Nossel Productions
(203) 269-4465

BALTIMORE, MD.
Sheffield Rec's Ltd., Inc.
(301) 252-2226

DENVER, COLO.
Applewood Sound Studios
(303) 278-9511

CHARLOTTE, N.C.
Reflection Studio
(704) 377-4596

DETROIT, MICH.
Pro Sound Studios
(313) 779-1380

DALLAS, TEXAS
Sound Techniques Inc.
(214) 638-3256

TULSA & OKLA. CITY, OKLA.
Ford Audio and Acoustics
(405) 525-3343

PHOENIX & TUCSON, ARIZ.
Lee Furr Studios
(602) 792-3470

WASHINGTON, D.C.
United Recording Co.
(301) 588-9090
(301) 565-3099

CIRCLE 75 ON READER SERVICE CARD

Only Technics gives you the world's most precise drive system, any way you want it.

Direct-drive precision. Now you can have it any way you want it. Because Technics uses direct drive in more kinds of turntables than anyone else. You can get it for under \$200 in the SL-1500. One of four manuals. Or for about \$500 you can have our professional turntable, the SP-10. There's a fully automatic single play model, the SL-1300. And the world's first direct-drive changer, the SL-1350.

And all these turntables share the Technics direct-drive system. A system so superior that FM stations have been using our direct-drive turntables for years. Here's why. In our direct-drive system, the platter is an extension of the motor shaft. There are no belts or idlers to produce variations in speed. So all our turntables have less than 0.03% wow and flutter (WRMS) (0.04% for the SL-1350).



Direct Drive System

You won't hear any rumble either. Because we use an electronically controlled DC motor that spins at exactly 33 or 45 rpm. And, unlike rumble-producing high-speed motors, our motor introduces so little vibration into the system that any rumble remains inaudible (-70dB DIN B).

And every Technics direct-drive turntable has variable pitch controls. A built-in stroboscope. And CD-4 phono cables. And for those that include a tone arm you also get viscous damped cueing. Anti-skating. Feedback insulated legs. Even a dust cover and an integral base.

But we don't have to tell you how good these turntables are. Read some of the reviews*. And see for yourself.

The concept is simple. The execution is precise. The performance is outstanding. The name is Technics.

*SP-10—Audio, 8/71; Stereo Review, 9/71; Audio, 10/73, 3/74.

SL-1100A—Stereo Review, 7/73; High Fidelity, 9/73.

SL-1200—Radio Electronics, 7/74; Audio, 7/74; Stereo, Fall '74.

SL-1300—FM Guide, 9/74; Stereo Review, 2/75.

FOR YOUR TECHNICS DEALER, CALL TOLL FREE 800-447-4700.
IN ILLINOIS, 800-322-4400.

Technics

by Panasonic

