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Profile: STUFF

MODERN RECORDING

SERVING TODAY'S MUSIC/RECORDING-CONSCIOUS SOCIETY

VOL.4 NO.12
SEPTEMBER 1979

A SESSION WITH FIREFALL

THE ELECTRIC PRIMER --Part 1

Lab Reports:
Aiwa AD-6700U Cassette Recorder
Crown PSA-2 Power Amp
Roland GE-810 Graphic EQ

HANDS-ON REPORT:
TAPCO C-12 Mixer

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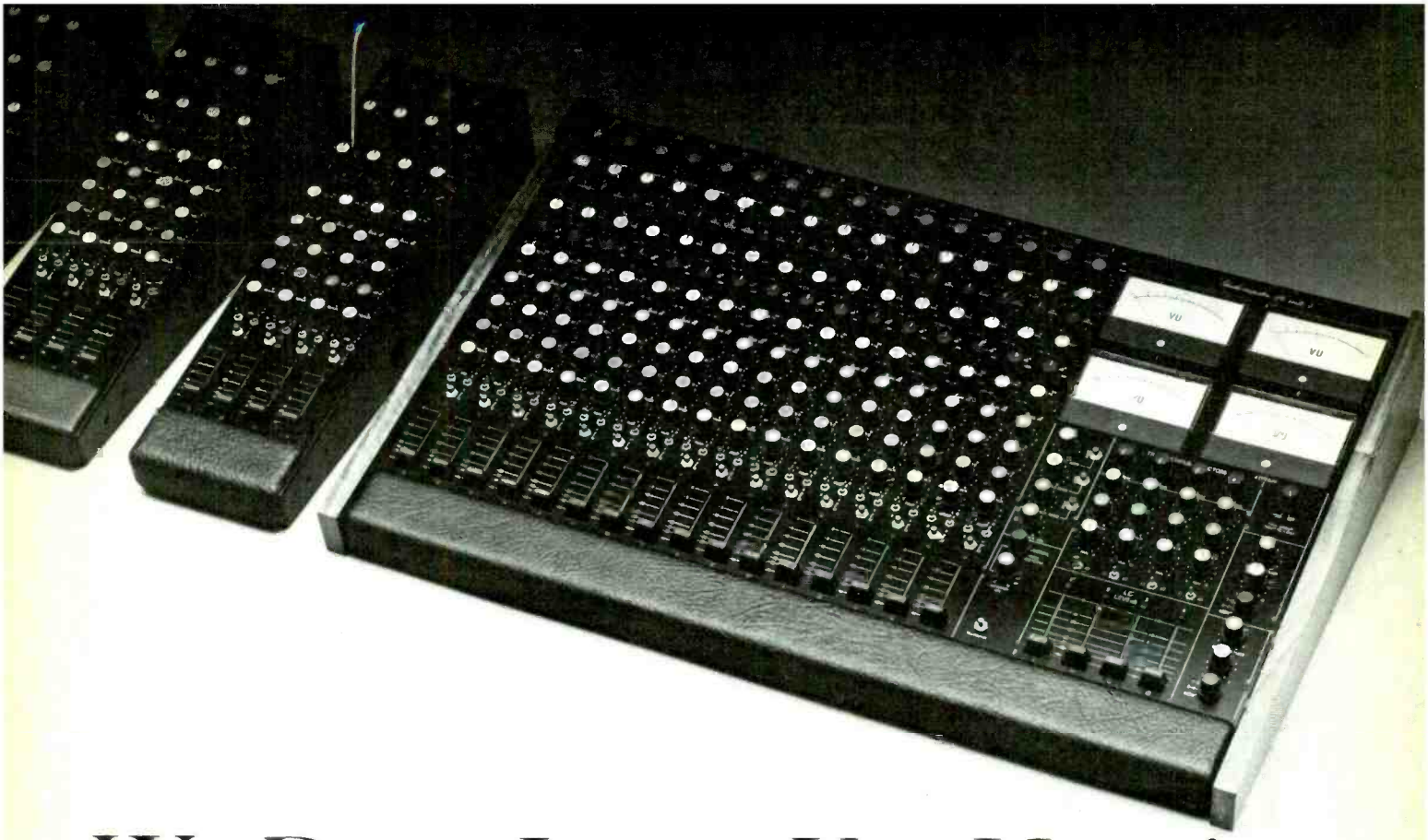
CIRCLE 94 ON READER SERVICE CARD



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Every once in a while, a product comes on the market that is so special, so different from the rest of the crowd, that it instantly becomes a classic. It is in this dimension that the Cube Amplifiers entered the music industry.

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CIRCLE 111 ON READER SERVICE CARD

SEPTEMBER 1979
VOL. 4 NO. 12

MODERN RECORDING

SERVING TODAY'S MUSIC/RECORDING-CONSCIOUS SOCIETY

THE FEATURES

THE ELECTRIC PRIMER —Part I 48
By Peter Weiss
Now that we all know *how* to use the many wonderous machines and gadgets in the recording world, perhaps it's time to sit down and find out *why* they work the way they do. A basic electricity course wrapped between our covers and ready to go!

A SESSION WITH FIREFALL 54
By Russell Shaw
MR heads down to Miami to discuss techniques with the producers and the engineer of this multi-talented group. A brief look at the operations of Firefall's latest.

PROFILE: STUFF 60
By Joel Siegel
If your first reaction to the above title is "Who?" then you haven't been studying your liner notes. These gentlemen are *the* New York rhythm section. They are the best at the session music trade, and also have some (three) fine "solo" albums on which they get to show off a bit.

COMING NEXT ISSUE!
A Session with Peter Frampton
The Electric Primer—Part II
Profile: Studio Designer John Storyk

THE STAPLES

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The technical Q & A scene.

THE PRODUCT SCENE 36
By Norman Eisenberg
The notable and the new, with a comment on new systems that provide "more signal, less noise."

MUSICAL NEWSICALS 42
By Fred Ridder
New products for the musician.

AMBIENT SOUND 66
By Len Feldman
Many of you have noticed the changes in our most recent lab reports. Specifically, in our "Vital Statistics" charts. If the additional information confused you, here's the column to clear it all up.

LAB REPORT 68
By Norman Eisenberg and Len Feldman
Aiwa AD-6700U Cassette Recorder
Crown PSA-2 Amplifier
Roland GE-810 Graphic EQ

HANDS-ON REPORT 80
By Jim Ford and John Murphy
TAPCO C-12 Mixer

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Reviews of albums by Levon Helm, Robert Fripp, Bob Berg, Warren Vache, Gilberto Gil and Benny Goodman.

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Letters to the Editor

That Dirty Word . . . Defended

First, let me congratulate you on a fantastic mag. I'm practically a charter subscriber, and will continue to be a subscriber for a long, long time.

Second, there's a current trend you seem to be missing the boat on . . . . . DISCO . . . . . There, now that I've said the dirty word I'll continue.

Are you aware that:

1—35 to 40 percent of *Billboard's* top 100 songs each week are disco (and the percentage is growing!)?

2—Almost all of these songs have specially re-mixed versions available on the 12″ "Disco Disc," (and the numbers are continually growing!!)?

3—*Better than half* of these special re-mixes have been mixed by disco DJs hired right out of clubs by record companies (and their numbers are growing!!!)?

Yes friends, record companies have finally gone directly to the people they are making the records *for*, to get the feel of what the people want. After all, who knows more about what sounds excite a crowd at a disco than the disco DJ himself? And some of these guys are doing one hell of a job too!

Disco is a very exciting and creative phenomenon. After all, a snare doesn't really *have* to sound like a snare. If the sound is right for the song, then it's OK. Special electronic effects and sounds like you've never heard before are showing up on disco records every day.

Just the thought that a major record company will give a 24-track tape to a disco DJ and leave him (with an engineer) alone in a studio to do with it as he pleases is *very* exciting. If he chooses to extend the intro, speed it up, slow it down, loop the percussion break, eliminate some vocals, lengthen the ending, he does it! More often than not, he ends up with a completely different arrangement and an exciting song.

A tip of the hat to these record companies and to disco music which made it all possible.

I consider myself lucky as I am a mobile disco DJ but also run a professional radio and production/recording facility during the week. This gives me a working studio knowledge most disco DJs lack. In fact, I have recently started doing disco mixes for record companies myself and the results have been very positive.

I feel an article on these disco DJs is in order as some of them are starting totally new careers with major record companies as the result of this.

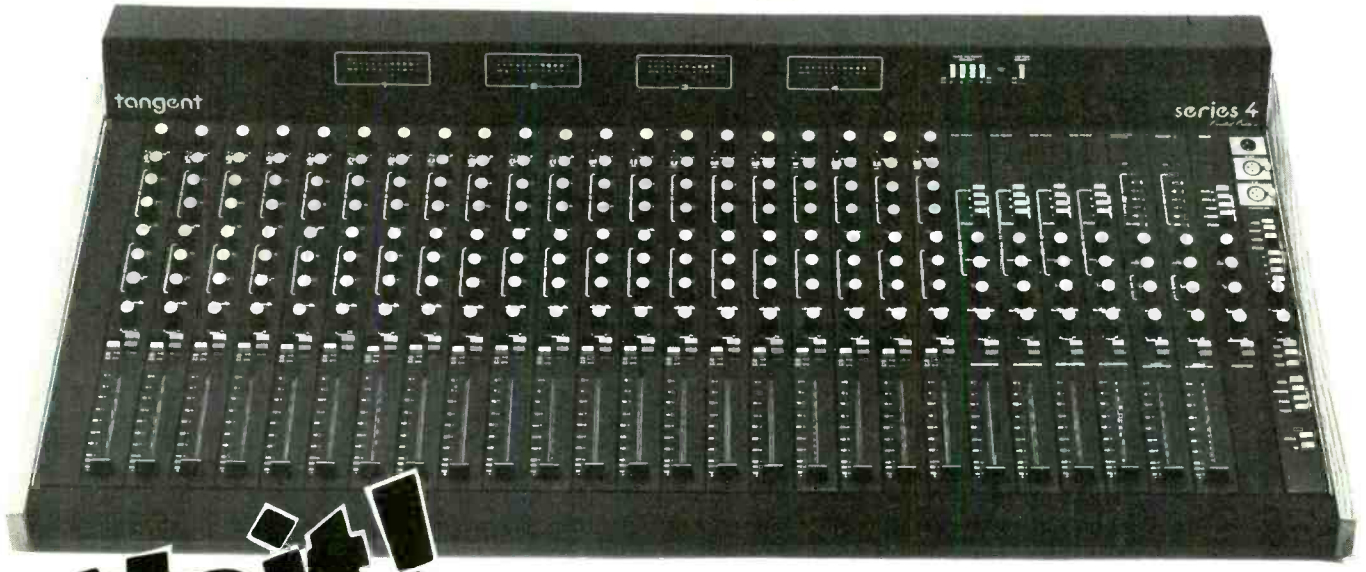
People say disco won't last, it's a fad, it's not music. They said the same thing about rock and roll 25 years ago. It may be a fad, or maybe it's here to stay, either way, at the moment it's the biggest thing happening in music and cannot be ignored!

After all, Disco *is* "Modern Recording!!"

—Ken Rapoza
Production Director/Engineer
WRKO Radio/Sound Creations
Boston, Ma.

Presently, we prefer to withhold comment on the tender yet tough topic of Disco. But we wouldn't mind hearing from others of you out there: How do the rest of you feel about Disco?

About to buy a mixer that's merely stereo?



Wait!

A simple stereo mixer isn't so simple when you have to control 24 microphones with a fader for each one. To simplify your over-mixed life . . . **Tangent's Series 4**. A Limited Edition four-out mixing console.

Submaster Mixing is easier.

Group a number of inputs together and control them with a single fader.

For example, seven microphones on a large drum kit is not unusual. It allows a fine-tuned balance among the drums and cymbals. But assume you want to bring up the volume of the entire drum kit. Moving those seven faders at the same time will probably destroy that fine-tuned drum balance. Not to mention the actual physical difficulty of controlling those seven faders, **plus** moving any other control that demands attention!

One fader controls an entire group.

On the Series 4, you set up your balance among the drums, then control the volume of the entire drum kit from a **single fader!** Your careful balance is kept, and the operation is much easier.

In the same way, you can group all the keyboards, or the backing vocals, or the horns into their own submaster for control from only one fader for each group. And Tangent's unique "Direct-to-Mains" function keeps submasters from being wasted with one-microphone sources.

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Four-track and eight-track recording is very convenient with the submaster flexibility. Extensive switching and monitoring facilities eliminate cumbersome patching during recording sessions.

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The Series 4 follows a pure tradition.

Tangent's commitment to sound quality has long been recognized. Our engineers have designed the lowest-noise, lowest-distortion circuits from the leading edge of today's theoretical limits. Combine this quality with Tangent's reputation for durability and ease of operation; you'll discover the finest four-out console on the market.

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Singing a Hero

Reading in your February 1979 issue, I came across Robert Henschen's "The Unsung Heroes of 1978—Track Two" (in "Groove Views," P. 110): It was very good for me (I'm a Brazilian music critic) to see the name of Milton Nascimento listed among those who were (unrightfully) forgotten. I'm writing now to congratulate you on this interesting article and to ask if you know all of Milton Nascimento's albums or just *Native Dancer* (with Wayne Shorter) and *Race* (the two released in the U.S.A.). If you people don't know all his work (I imagine it is difficult to get these), I urge you to seek them out!

—Carlos Alberto Placido
Rio de Janeiro, Brazil

Dylan Mics

I enjoyed reading the article, "Bob Dylan 'Live'" by Peter Weiss. The equipment analysis was quite complete and the author's personal philosophies were of additional interest.

I noticed, though, that Mr. Weiss made no mention of the type(s) of microphones used when Dylan performs, particularly those used on the vocals. The article did stress the importance of the clarity and articulation of the vocal mix. What kind of mics does Dylan rely on to achieve the vocal emphasis so important in his performances? Thank you for satisfying my curiousity.

—Gregory Linder
Janesville, Wisc.

Mr. Weiss did include with his manuscript the setup sheet for mics, but due to space limitations, we were forced to abandon the thought of using it within the February 1979 Dylan cover story.

According to the chart, Dylan was vocally miked with a Shure SM57, as were Steve and Billy. Shure SM58s were used on the female vocals.

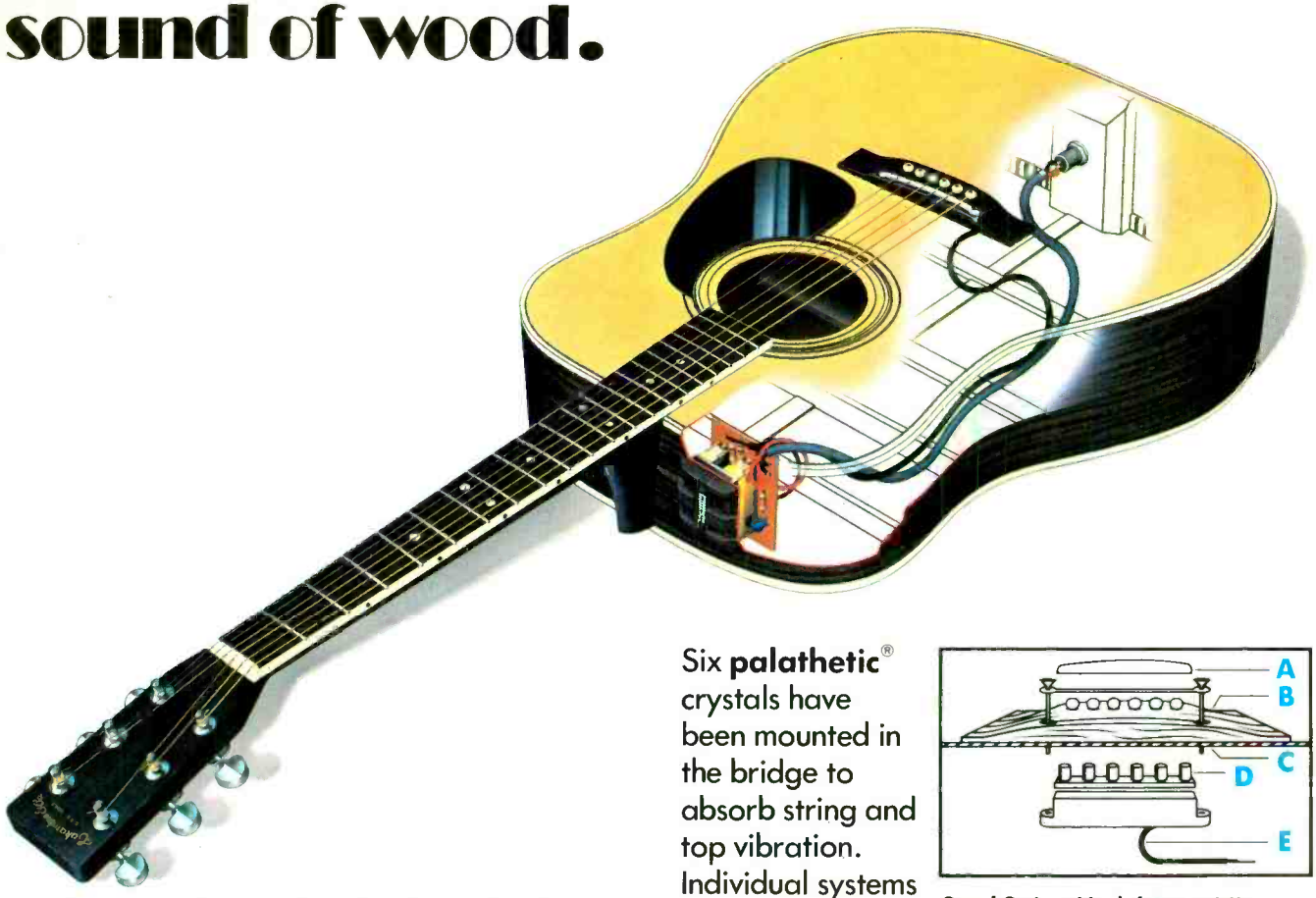
Updating the Specs

We have discovered and been advised of a few erroneous items within our "Deciphering Mixer Specs" article authored by Brian Roth, and published in the February issue:

Figure 6 on page 62 was incorrectly calibrated in octave steps, rather than linear steps. Refer to the corrected diagram.

On page 64, third column: The second

TAKAMINE amplifies the natural sound of wood.



For more than a decade, Takamine has created acoustically exacting instruments. The finest woods are carefully crafted into guitars which produce a pure, rich sound. The classic model features a cedar top and fan bracing pattern, while the steel stringed models employ a spruce top and X bracing pattern. Both designs project resounding highs, clear mid-range and full lows.

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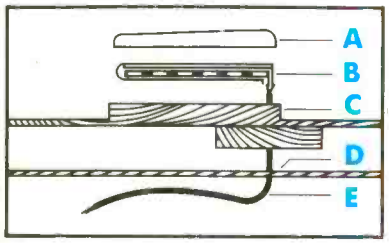

Classic Model A. Saddle; B. Palathetic® Crystals; C. Bridge; D. Guitar Top; E. Pickup Wire

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CIRCLE 39 ON READER SERVICE CARD

PATCHWORK PAYS OFF.

When you start working with an 8-track recorder, there's a great temptation to rush out and buy a so-called "8-track" board. Forget it. You don't need the fat price tag. Because what you're really looking for is 8-buss operation.

That's why we've put together a systematic approach to 8-buss operation built around our new Model 5B. You get control over all your tracks. Total access to the signal flow. The ability to adapt quickly to each new session. And a rather large savings in cash outlay.

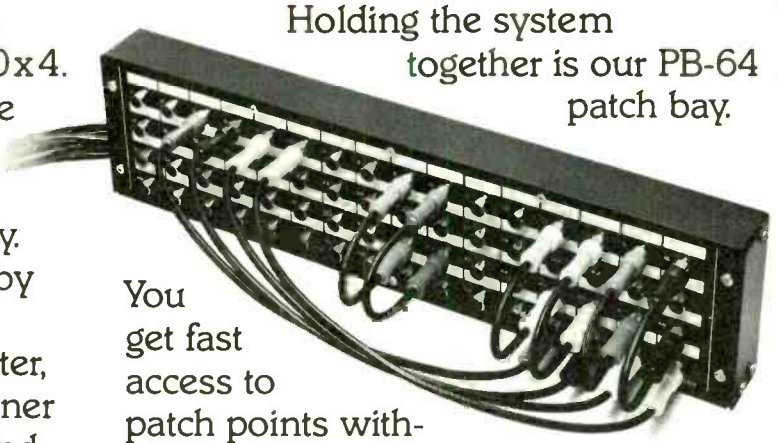
It starts with our new Model 5B. Eight-in/four-out. Expandable to 20x4. Color-coded controls get you where you're going faster, with fewer miscues. And new ICs have been incorporated throughout its circuitry. The slew rate has been improved by a factor of four. The result: better transient response. Tighter, sharper, cleaner sound.

Now add the Model 1. It gives you an independent 8x2 mix anywhere, anytime you need it. During basic tracks and overdubs, it's your monitor mixer. During final mixdown, it's ready for stereo echo. Any time you need another 8x2 mix, it's right there.

Our MB-20 lets you meter any line level signal you want. That's handy when you're using one mic or one instrument per track and driving your 8-track with the Model 5B's direct outputs.

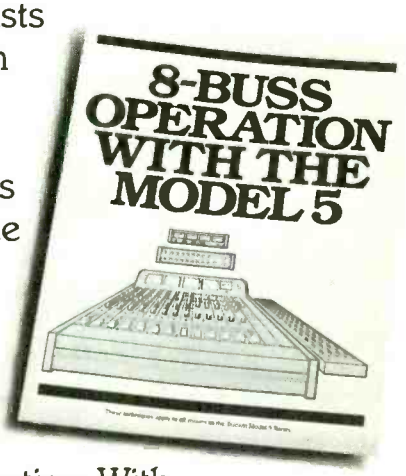
There's also some extra mixing flexibility in the MB-20. You get Buss/Tape selectors and an independent 4x2 monitor mixer.

Holding the system together is our PB-64 patch bay.



You get fast access to patch points without crawling behind and under your rig. You use jumper cables like push-buttons to route signals. And you don't get trapped into one hard-wired configuration. You can grow, change or completely re-arrange your set-up without throwing out the gear you've already invested in.

That's the Tascam concept of modularity. One that's paid off for recording artists for more than seven years.



See your Tascam Series dealer or write us for a free copy of our operations/hook-up bulletin, "8-Buss Operation With The Model 5." You'll see the functions you need. At a price you can afford.

Because patchwork does pay off.

TASCAM SERIES

TEAC Professional Products Group

CIRCLE 125 ON READER SERVICE CARD

sentence should read, "The power level would be +20 dBm." The next sentence should begin, ".075 volts across 600 ohms would be..."

Finally, in Figure 9 on page 68, the voltage calibration on the right hand side at "residual output noise" has a misplaced decimal point, and should read 77.5 volts, rather than 7.75 volts.

Our thanks to both the author and to Professor Wieslaw Woszczyk, director of the recording studio at McGill University in Montreal, Quebec for bringing these to our attention. Our apologies for having provoked any confusion with these errata.

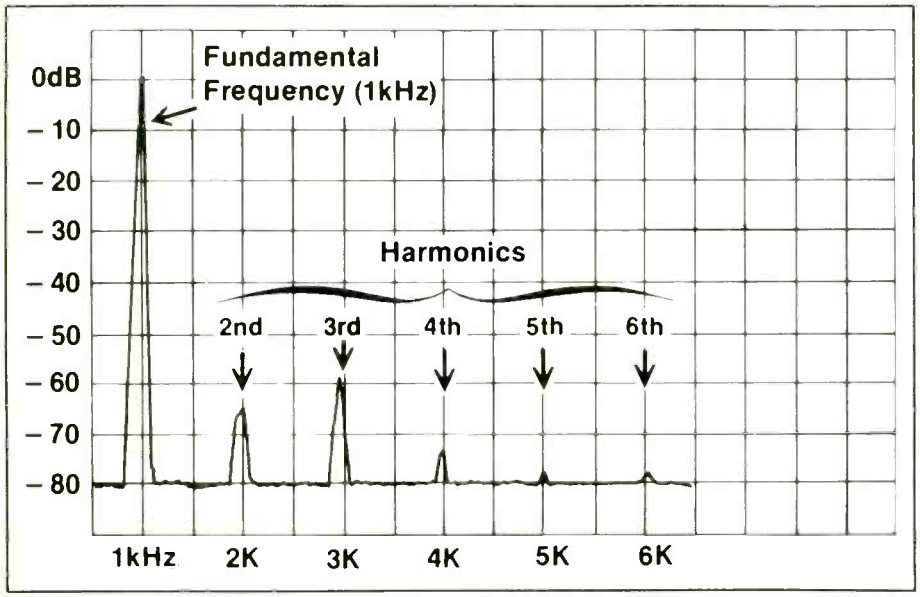


Fig. 6: Spectrum analysis of output of mixer shows relative levels of harmonics due to distortion.

Furman

We need to contact the Furman Company, per your April 1979 Issue on their products (reference pp. 82-84). Could you please publish their address? Thank you for your cooperation!

—Charles E. Koontz
E-S-H SYSTEMS
Fairfield, Ill.

Furman Sound, Inc. is located at 616 Canal St., San Rafael, Ca. 94901; phone (415) 456-6766. (Len Feldman and Norman Eisenberg had reviewed the Furman Sound PQ6 Equalizer in "Lab Report" of MR's April 1979 issue.)

Interface Solutions

Having just finished a recent issue (April 79) from cover to cover, I happened on the letter in "Talkback" from Edward Klein regarding his recommended solution to the interface "problem," i.e.,

At 1⅞, it outperforms other cassette decks. At 3¾, it's in the open-reel class. B·I·C introduces the T-4M. With full metal tape capability, and performance so unprecedented it puts cassette technology on a new plane. Thanks to B·I·C's exclusive Broadband Electronics, at 1⅞ ips the T-4M ranks with the world's finest cassette decks. At 3¾, it challenges even expensive open reel machines. The numbers speak for themselves: guaranteed frequency response of 20 Hz to 23 kHz ±3dB at 3¾ on 70 μSec tape (20 Hz to 21 kHz at 1⅞!). For complete literature write B·I·C/Avnet, Dept. T, Westbury, N.Y. 11590. **The new T-4M Two-Speed Cassette Deck.**

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CIRCLE 131 ON READER SERVICE CARD

a complete signal processing/sound reinforcement system in one case.

At this year's NAMM Show in Atlanta, we at TAPCO will be announcing not just one, but three such systems, completely wired, and complete with case(s) and cables. If we are successful in reaching our targeted goal, we will have taken out as much of the costs of such a unit as is possible, without diminishing the quality, and will be offering through our dealers complete systems including speakers at easily affordable prices.

We couldn't agree more that Mr. Klein has addressed one of the most frustrating problems faced by the single performer or small group.

—Ferdinand Boyce
Sales Manager
Tapco
Redmond, Wa.

Connector Query

Reading Fred Ridder article on "Meat Loaf - Recorded", *Modern Recording*, January '79, it was mentioned that the Amphenol MS series connector was not tough enough for rock & roll usage.

I would like to know: 1) the weak points of the Amphenol MS connector, 2) what series of Amp multi-pin connector Fred made reference to.

Great magazine—keep it up....

—Bill Beatty
TeleVisual
Springfield, Ill.

We got Fred to pen some clarifying words on connectors, which follow:

It seems I may have overstated the case against MS series multi-pin connectors and the case for the newer A-MP connectors in my "Meat Loaf—Recorded" article. The fault with MS series connectors manufactured by Amphenol, ITT Cannon and others is not so much that they are not rugged as that they are not idiot-proof.

Record Plant and other studios and professional audio concerns originally specified the MS series connectors because of the ruggedness implied by their military heritage. The problem is that these connectors require a moderate amount of care when mating two connectors to prevent mis-seating and subsequent pin bending, and they require protection and/or careful handling when not connected to prevent bending or distortion of the pins or the metal connector shell which would render the connector useless. Unfortunately, a rock-and-roll show is not a good place for *any* piece of equipment that requires much thought or special care.

Record Plant's experience with MS connectors has been that well over 80% of all failures are the direct result of carelessness or operator error—typical failures range from the occasional bent pin incurred when the crew is too pressed for time to ease the connector home, to cross-threaded locking rings (which usually requires replacement of the entire connector shell on both sides) to the catastrophic damage caused when an uninitiated stagehand attempted to disconnect a cable from a panel by unscrewing the back-shell and strain relief of the connector rather than its locking ring, severing every wire in the connector in the process.

The A-MP connectors, on the other hand, are less susceptible to shell damage thanks to their polycarbonate and stainless steel construction, and connector mating is virtually fool-proof thanks to a positive alignment shell design incorporating pre-engagement

The dawn of the noiseless disc.

Like most music lovers, you've probably had it with the scratchy surface noise that always seems to ruin the music on your records. Well, dbx® Encoded Discs™ make record surface noise a thing of the past. When decoded with the new dbx Model 21 Disc/Tape Decoder (or dbx Models 122, 124 or 128 Noise Reduction Systems) and played back through any quality stereo system, dbx Encoded Discs reproduce music as you've never heard it before. Music with exceptional clarity and realism against a background of silence. Sound that is virtually indistinguishable from that of the original master tape.

For the past 50 years claims have been made for new breakthroughs in record technology, but until now no vinyl record has been free from the record surface noise that has plagued even state-of-the-art digital and direct-to-disc records. For the first time you can experience at home the emotional impact, excitement and musical sparkle of the finest studio master tapes — from dbx Encoded Discs.

With the cooperation of many respected record labels, dbx has obtained superbly engineered master tapes for remastering as dbx Encoded Discs. By use of unique dbx noise reduction technology, the surface noise on dbx Encoded Discs is typically 30dB lower than on conventional records, and in many cases, they will provide up to a 50% increase in dynamic range (the difference between the loudest and the quietest music passages).

On conventional records, loud passages of music are cut on the master disc as widely-spaced grooves. Music of wide dynamic range, therefore, requires limiting the playing time of each LP side. Even worse, music peaks are often compressed to allow cutting narrower grooves, while quiet passages are boosted to keep the signal above the record surface noise level.

Limiting, compression and "gain riding" of the music signal need not be employed when producing dbx Encoded Discs, because of the unique operation of the dbx encode/decode process. The full dynamic range present in the original master tape is provided by dbx Encoded Discs without restricting playing time. Any noise you'll hear will more than likely be the noise that was present in the original master tape. Turntable rumble and groove echo disappear along with the record surface noise, while inner-groove distortion is reduced as well.

dbx Encoded Discs have been described as the most significant advance in recorded disc technology since the introduction of stereo some 25 years ago. However, this is something you should judge for yourself. Visit your nearest dbx dealer and let him play a dbx Encoded Disc through the dbx Model 21 Disc Decoder on any quality stereo system. You too can enter the new, noise-free world of recorded music for less than the cost of a fine phono cartridge.

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CIRCLE 108 ON READER SERVICE CARD

of the housings before the pins and sockets engage, guide pins on the connector blocks, and a positive, lever-actuated camming latch mechanism. Additionally, the A-MP connectors are fully modular, allowing total flexibility in choice of connector inserts, choice of contact pins (choice of pin size, pin type, wire size, and plating), and also in the choice of strain relief and mounting hardware types.

The A-MP connector used for main snake applications by Record Plant New York, Record Plant Los Angeles, and Wally Heider Recording is the A-MP Coaxicon Latching Connector with three 50-position AMP-INCERT Series M contact blocks, using Type III(+) crimp-on, snap-in, gold/nickel plated, size 16 contact pins for 22-20 gauge wire. This is only one of literally hundreds of possible configurations using the basic Coaxicon housing, and anyone contemplating using this connector series would be well advised to talk to A-MP Special Products Division (A-MP Incorporated is located in Harrisburg, Pennsylvania).

Anyone interested in the particular configuration used by these several remote recording operations should contact David Hewitt, Director of Remote Recording at Record Plant New York, who was my source of information, or Jack Crymes of Record Plant Los Angeles, who originally proposed this connector system.

—Fred Ridder
Contributing Editor
Modern Recording

Creek Behind House May Become Musical Wasteland

I have been an avid devotee of your magazine since the Feb/March issue of '76. During this time I have gained much useful information and enjoyment from your publication. I particularly like the "Talkback" and "Musical Newsicals" sections. I have been a semi-pro musician for the past 7 years and here in the musical wasteland of South Carolina your magazine is one of the few ways one can keep up with new developments in the music performance/recording areas.

I have written to a publication before, but I have a serious problem and you are my only hope. I am sure other readers have similar problems, so please give us any assistance you can.

Three years ago I purchased a

The first choice of those who refuse to settle for second-best.

The true audio perfectionists are those who demand state-of-the-art performance from every part of their system. For these trend setters, second-best just won't do.

At TDK we consider ourselves perfectionists, too, so it's gratifying to know that TDK SA is the number one selling cassette to these critical listeners.

Perfectionists demand the best possible sound quality. SA is the high bias reference standard; most quality manufacturers set up their decks in the factory to sound best with SA.

Perfectionists appreciate technological superiority. SA's advanced cobalt-adsorbed gamma-ferric oxide particle formulation made it the world's first non-chrome high bias cassette. And many parts of its super precision mechanism, such as its double hub clamp and bubble surface liner sheet have yet to be equalled.

Perfectionists insist on reliability, and they know that TDK was first with a full lifetime warranty*—more than 10 years ago.

You may not be an audio perfectionist; you may not be able to afford an ultimate, cost-no-object stereo system. But it's comforting to know you can get better performance from your present system by using the tape you'd buy even if you had a million to spend—TDK SA. TDK Electronics Corp., Garden City, New York 11530.

* In the unlikely event that any TDK cassette ever fails to perform due to a defect in materials or workmanship, simply return it to your local dealer or to TDK for a free replacement.

TDK®

The machine for your machine.

Dokorder 7500 reel-to-reel recorder. It is a solenoid-controlled auto-reverse model. I soon realized I had a lemon because during the first year it began to malfunction. In either the playback or record mode, in either direction, the machine would run for a short length of time (sometimes a few minutes, sometimes only a few seconds) and then shut itself off as if someone had hit the "stop" button. The serviceman at my dealer's could not fix my unit so it was sent for factory service to California. Three months later it was returned, in working order, and all was well. . . for a while.

Recently it began exhibiting the same symptoms as before and eventually would not even go into either play or record modes. The dealer I bought my unit from has sold out to another store and Dokorder itself has gone out of business. Somewhere in the original repair hassle my schematic was lost. The repairman I have just contacted says that without the schematic there is no possible way he can figure out my unit and diagnose the problem. He has tried several sources and I have repeatedly called the Dokorder number listed in your Winter '79 Buyer's Guide. I've never gotten an answer. So here I sit with a $500 piece of equipment that's about as functional as a pet rock.

Where could I obtain a schematic for my unit, or better yet, be assured of a professional (and hopefully final) servicing of my machine? The general consensus of local hi-fi dealers I have talked to is that my best bet is to toss my Dokorder into the creek behind my house and buy a new (preferably very expensive) Teac or Tandberg. I've considered it, believe me. But even if I resorted to such an extreme solution, how do I keep from ending up in this same situation again some day? The built-in obsolescence, short life of specific models, and overnight vanishing of entire companies like Dokorder has me extremely fearful of buying any piece of electronics. And I'm not referring to updating or improvements in design, for I realize that in any highly technical area such as electronics, progress is not only to be expected, but to be appreciated and encouraged. By the way, no one around here seems to know why Dokorder went out of business. Is the reliability of my unit typical of the entire line? If so, the question is answered.

Thank you very much for your time and for publishing such a fine magazine. Any information, suggestions, or opinions you could pass on would be deeply appreciated.

—Randy Carrigan
Greenville, S.C.

So far, we too have been unable to reach Dokorder, whose representative had assured us, back in November 1978, that the company (although no longer manufacturing) was maintaining an address and phone to provide information, manuals, warranty service, etc.

We thought we had something of a solution for you, though: Howard W. Sams & Co., Inc., 4300 West 62 St., Indianapolis, In. 46206, publishes Sams Photofact®, *a servicing manual available in several volumes for several different specialized product areas (dating back to 1946), including Tape Recorders. Gleeful at the prospect of helping you with your Dokorder, we rang Sams up—and unfortunately found, after inquiring, that the Dokorder 7500 is not listed in their* Photofact Index *as having been*

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powered by Bose 1800 amplifiers, do it all.

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covered in an annual volume.

Exhausted and out of breath after a number of other goose-chase calls on this topic, we sat down and wrote you this less than helpful answer.

Realizing just how functional pet rocks tend to be, we do commiserate with you, Randy, and have not begun to abandon our search for Dokorder. We'll publish whatever we come up with, when we come up with it. Meantime, any readers with the scoop?

Digital Vs. I.R.S.

I found the reprint of an "Ambient Sound" article by Len Feldman in the 1979 *MR Buyer's Guide* regarding Pulse Code Modulation recording to be a terrible tease. Here I am with my income tax refund check, and I read an article about how PCM will change the recording industry. In the article, it states, "Nearly half a dozen companies exhibited [at a Tokyo high-fidelity show] various forms of tape recorders which employ this new recording technique." Well, how come I spend three nights reading the specs on 162 tape decks and I can't find *one*?

Sure, you mention the Betamax video system by Sony, but what about the other companies you could easily have mentioned so that us taping nuts could at least have someone to write to for information?

If it is all possible, *please* tell me more about those companies so I can find one before I spend my income tax refund on bills or something.

—David P. Cyr
Millinocket, Me.

Actually, there aren't many models we can name for you. Most of the products shown at that Tokyo show were prototype units and not commercially available. More recent showings, in this country, have been at exhibitions of the Audio Engineering Society (write to them, 60 East 42nd St., New York, N.Y. 10017 for more information). To update further, 3M company has recently begun leasing its digital system to two of four studios scheduled so far to receive it, and Dr. Thomas Stockham's Soundstream Inc. has arranged plans for digital recording sessions with its system.

We must warn you that your income tax refund check will not very likely cover the price of any PCM unit you might be looking forward to purchase. You verily may be forced to put that money towards bills or something.

Harmonizer Notes

In looking through an old issue of *MR* (November '78), I came across something in the article on the Atlanta Rhythm Section that interested me. It was the Eventide "Harmonizer." I haven't been able to find any information on this. Could you please give me some information or an address where I could get some brochures and price lists on this item? Any help would be greatly appreciated.

—Joseph Sherlock
Flushing, N.Y.

Eventide Clockworks, Inc., is located in New York, N.Y., at 265 West 54 St. (zip 10019, phone (212) 581-9290). Their Harmonizer is a digital delay line and continuously-variable pitch changer. Recently, Eventide has introduced a new model of the Harmonizer. Give them a call for more information.

"a professional studio recorder with a handle"

"ReVox new B77 is long on performance and short on Mickey Mouse features."

That's what Herb Friedman said about the ReVox B77 in Hi-Fi/Stereo Buyers' Guide.* If you're a serious audiophile or location recordist, you'll be interested in what Herb has to say.

In addition to evaluating products for Hi-Fi/Stereo Buyers' Guide, Herb Friedman is Chief Engineer for Tridac Electronic Laboratories and a major New York radio station. As such, he produces taped programming and he knows the real differences between truly professional recorders and others that claim to have "professional features".

Differences like 18dB record headroom, flat response with no low-frequency "head bumps", the highest usable dynamic range and the lowest noise of any audiophile recorder. Add to these such features as all-digital-logic-control of tape motion, large meters with LED peak level indication, self-contained tape splicer, and a rugged 37-pound package with a handle and you've got the best recorder in the world.

If you'd like to know what else Herb Friedman thinks about the B77, please circle reader service number or write to us for complete information including a reprint of his article and a list of dealers where you may see and hear the ReVox B77 demonstrated.

REVOX

Studer ReVox America, Inc., 1819 Broadway, Nashville, Tennessee 37203 (615) 329-9576
In Canada: Studer ReVox Canada, Ltd.

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CIRCLE 91 ON READER SERVICE CARD

Don't let your speakers control your sound...

Electro-Voice stage systems put you in control.

Why should a musician allow his creativity to be limited by his speaker system? With amplifiers, pre-amps and the myriad of other state-of-the-art electronic devices available, why should a musician limit his sound by playing his equipment through a speaker system that hasn't changed in design since 1957? The answer is he shouldn't, and with Electro-Voice Stage Systems he doesn't have to. These three new instrument speaker systems let you hear all the sound your instrument is capable of producing, the way you want it to be heard, by choice not by chance.

The S18-3 lets you hear all the notes you never heard before from your keyboard or synthesizer from below 40 Hz to above 16,000 Hz. The famous EVM-18B delivers the bass. The Electro-Voice exclusive vented midrange driver delivers the midranges as efficiently as a horn, but without the typical "honky" small horn sound. The ST350A tweeter gives you clean highs over a solid 120° angle, eliminating the high-frequency "beaminess" that limits the enjoyment of your performance to the few people sitting directly in front of the speaker.

The two new bass guitar systems also incorporate the VMR™ vented midrange. It can be controlled from the front panel, thus giving the bass player total control over the midrange harmonics missing from "standard" bass enclosures. The B115-M uses a single EVM-15B in an optimally vented enclosure. The result is the tight sound preferred by many jazz bassists and studio musicians. The B215-M has two EVM-15B's for a bass sound with more "carry"; perfect for the larger venue or for the rock musician who wants more low-frequency "punch." In both cases, the VMR brings out sounds you may have heard before only on studio recordings.

All systems have identical styling. Black vinyl covered ¾" plywood construction for durability, further protected by extruded aluminum trim on all edges. A metal mesh grille screen protects the drivers from accidental abuse.

If you want to have control over your sound, these are the speakers for you. See and hear these superb instrument speaker systems at your Electro-Voice dealer.

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Corner Music
Electra Dist. Co.
Musician's Flea Market
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Tennessee Audio

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CIRCLE 82 ON READER SERVICE CARD

TALKBACK

"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 Magical Number Three

After reading the Nakamichi booklet describing their three-microphone recording technique, I would like to learn how I can use this technique with my four-track deck with Sel-sync capability to make better stereo recordings. I am aware that the Nakamichi cassette decks have a built-in effective 3:2 mixer for mixing the center, or blend, channel with each of the stereo channels for a final stereo.

With the recorder in four-channel record mode and three microphones, I can record three signals on three separate, i.e., tracks 1, 3 and 2. However, it would appear that after such recording, I would need an outboard mixer to stereo and then another deck fed from the mixer to record the final stereo tape. I also have two cassette decks—a Kenwood KX-1030 and a JVC KD-2 portable.

Your comments and suggestions for effectively adapting my equipment to use the Nakamichi recording technique in making improved "live" stereo recordings on either reels or cassettes would be well appreciated.

—James R. Hall
McLean, Va.

To those who have limited experience in "live" recording, it may be inconceivable that the use of three microphones can produce results markedly different from the use of two, the minimum number of microphones needed to make a stereo recording. But, as many "live" recording enthusiasts around the world have discovered for themselves, the addition of a third microphone can produce a quantum jump in recording quality, often making the difference between an ordinary and a startlingly real recording. Before answering your specific question regarding the use of your four-channel deck, it might be helpful, especially to those readers who have not studied the Nakamichi "live"-recording booklet, to discuss some of the thinking behind three-microphone recording.

As with any recording technique, there will be those who agree and those who disagree with the three-mic technique. Especially in today's recording climate, wherein we are experiencing a renaissance of simple microphone technique, such as the "X-Y" coincident pair technique, the use of anything more than two mics for a stereo recording will elicit an immediate round of head-shaking and "booing" from certain purist circles. I happen to believe that the reversion to these primitive techniques is merely an over-reaction to modern "multi-mono" studio recordings. (More head-shaking and booing.) This is not to say that one cannot make a good stereo recording with only two microphones. History is replete with examples to the contrary. It is, however, *very difficult* to make a good "live" recording with only two microphones. This is where judicious use of three and possibly more microphones comes in.

The Nakamichi technique is based on the fundamental differences between binaural (headphone) reproduction and stereo (loudspeaker) reproduction. In binaural reproduction, sound pressure variations are recorded as they appear *at the ears* of a "live" listener and subsequently reproduced *at the ears* of a home listener through a pair of stereo headphones. Binaural recording is usually accomplished through the use of two omnidirectional microphones placed at the ear openings of an actual human listener or a "dummy head" (hopefully not one in the same). When such a recording is played through stereophones, the effect can be an uncanny, you-are-there realism. By recreating the sound field as it appears to a "live" listener, the home listener can take advantage of known psychoacoustic effects, such as precedence or masking effect, which enable him to locate and identify various sound sources with surprising precision, even if the "live" listener was sitting very far from the performance and/or the hall was excessively reverberant. Stereo reproduction through loudspeakers cannot take advantage of such effect. As a result, two-mic recordings usually approach one of two extremes: very dry (too closely miked) with an exaggerated stereo image, or very muddy (distant) with diffuse lateral source localization. That a good binaural recording is totally unlistenable over loudspeakers is a case in point.

In three-mic recording, the basic idea is to control the balance between direct and reflected sounds by using separate microphones to capture early and late arrivals, respectively. In the illustrated example, the left and right microphones are the normal stereo or "room" microphones, placed to pick up reverberation and lend some sense of "depth" to the sound. The center or blend microphone picks up mostly direct sounds from the piano and is thus placed relatively close to the strings. It is the blend mic that conveys the percussive qualities of the piano and pinpoints the position of the sound source on the stereo "stage".

Needless to say, proper balance between the stereo and blend microphones is extremely important. A heavy dose of the blend mic will result in flat, close-to-monaural sound. Lack of the center channel, on the other hand, will get you right back to the problems associated with two-mic stereo recording.

Incidentally, this approach to miking is the basis for more sophisticated techniques. A good "live" recording engineer, no matter how many microphones he may use for close pickup, will always mix in a pair of pure left-right "room" mics to preserve the acoustical character of the room or hall in which the performance takes place. The use of multiple microphones, of course, always introduces the possibility of phase cancellation and the resultant "comb filter" effect. This is why I believe "3" is a sort of magic number for amateur "live" recording.

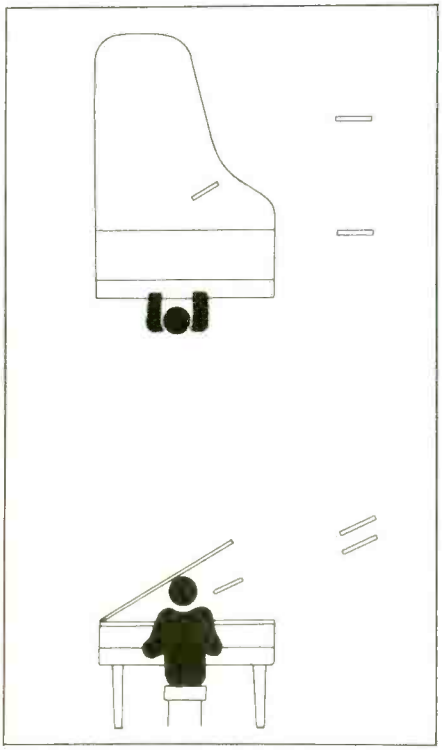


Illustration courtesy of Nakamichi U.S.A. Corp.

To my knowledge, the blend mic feature is unique to Nakamichi decks. Anyone who wishes to experiment with three-mic recording, however, can do so by obtaining a simple microphone mixer. Nakamichi markets a small mic mixer with three pre-assigned (left-blend-right) inputs for this express purpose, but any mixer with at least three mic inputs and panpot capability will do the job. With a panpot mixer, assign one mic to the left channel, another to the right channel, and a third to "center."

You have already realized that you

cannot implement the three-mic technique with your four-channel deck alone. In fact, since the three-mic technique is a *stereo* recording system, anything more than two recording channels is really superfluous. There is simply no getting around the purchase of a mixer. Assuming that you have a stereo (rather than a quadraphonic) playback system, I would think you should have a 4-to-2 mixer in any event to make full use of the four-channel deck.

It is possible, as you suggest, to record the left, right and center mic signals onto three separate tracks of your four-channel deck for a subsequent mixdown onto two tracks. While this method does enable the recordist to mixdown "after-the-fact" under more controlled circumstances, I think it is hardly worth the effort of toting a four-channel deck around. In order to check microphone choice and placement, an on-the-spot stereo mixdown would be necessary *regardless* of the availability of a separate track for each mic. If you're going to bring your mixer to a "live" recording session, and if your end-product is going to be a stereo cassette, why not just do the original recording on your cassette deck? It'll be a lot easier on your back, and you'll eliminate one tape-copying step.

—Harron K. Appleman
Technical Director
Nakamichi U.S.A. Corp.
Carle Place, N.Y.

Routing Remote Cables

I have just recently started a small company doing recording and reinforcement and I have grabbed just about every book, magazine, technical sheet, etc. *anything* to help me learn more about the audio field. Out of all the material I have read in the past year, *MR* is by far the most informative, and yet still understandable, publication I have seen. If I could, I'd enter a lifetime subscription right now!

I've done a number of outside remote jobs where it was necessary to run much of my cable on the ground. I am looking for some method of fastening my cables to the ground, so that I can route them out of the way and leave them there, without worry!

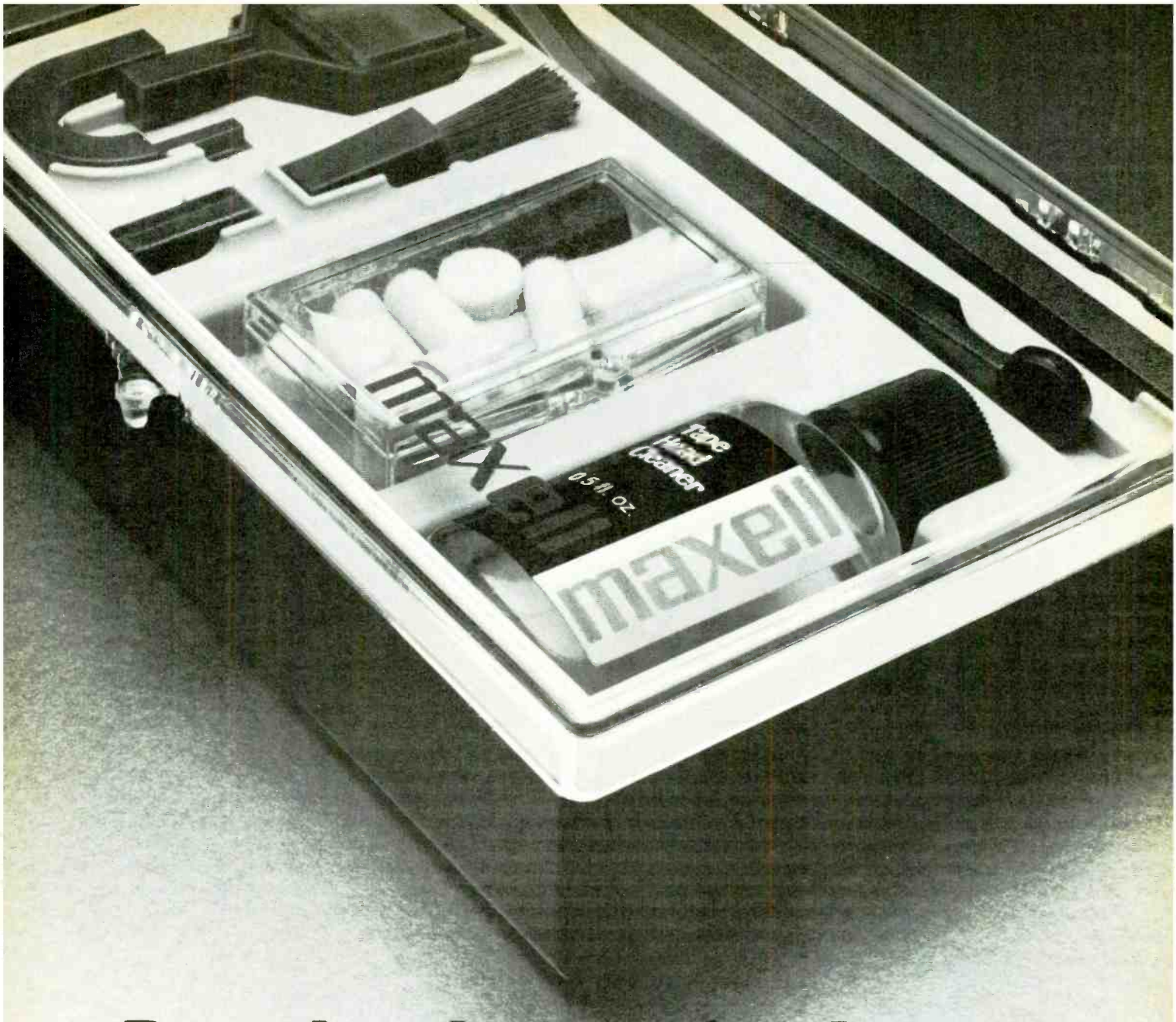
One idea that has worked fairly successfully for me is to take eight- to ten-inch pieces of wire coat hangers and bend them into a "U" shape. These work like large staples that can be pushed into the earth to hold the cables in place. Is there something commercially available that does a similar job? What method do the large sound reinforcement companies use to get their cables from the stage to the area where the mixer is located?

Keep up the good work. There are thousands of people like me who are benefitting tremendously from *MR*—thanks!

—Larry L. Lloyd
Lloyd Sound
Mankato, Minn.

You'll be happy to know that the sound people that we contacted in regard to this question all felt that your method for anchoring outdoor cables was quite inventive. The drawbacks of your method—the "staples" don't afford the cable any protection, they might pull out of the ground easily, the wire itself could slip out, or people could possibly catch their feet in either the staples or under the cable—could, however, prompt you to look for an alternative method.

David Tkachuk, audio engineer with Capron Lighting and Sound of Needham Heights, Massachusetts, informs us that they "roof" their outdoor



People who aren't using our new tape care kit should have their heads examined.

After every ten hours of recording or twenty hours of play back, you should spend a few minutes cleaning your tape heads.

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In addition to liquid head cleaner, it has special curved probes, swabs, a brush and a mirror to help you keep even areas you can't see spotless. All of which means you'll be getting maximum performance out of your machine. Year after year.

And if that doesn't sound like a good idea, maybe you need to have more than your tape heads examined.

maxell

CIRCLE 79 ON READER SERVICE CARD

Maxell Corporation of America, 60 Oxford Drive, Moonachie, N.J. 07074.

cables with wooden planks and tape the "peak." This protects the cable and can be walked on or even driven over without harming the cable. David goes on to say that they use this method in aisles or heavily trafficked areas. Cables that pass under seats are usually left alone. Also, for long runs of cable this method can become expensive.

Will Parry, Operating Manager with Maryland Sound Industries which is based in Baltimore, Maryland, tells us that, depending upon the date, they do one of four things. Some sites have permanent conduits running through the ground. When this is the case, they simply pull their cables through the existing pipe. Sometimes, when conduits aren't available, they bury the cable. On other occasions, they place heavy rubber mats or runners over the exposed portions of the cables. A final alternative is to "fly" the cables. The snake is attached to a heavy metal wire which is then suspended above the ground. Will personally feels this last method is the best since it take the cables up and out of the way of the crowds.

A spokesman for Tasco Sound Ltd., of Newbury Park, California, pretty much echoed the methods outlined by Will and went on to confirm that these are the methods of routing cable most frequently used by the pro companies.

When asked about commercial counterparts to your staples, the major reaction was "what for?" Your materials are plentiful, disposable and most attractive of all—Free! Who could ask for more?

Misplaced Instructions, Well-placed Concern

This question doesn't deal strictly with recording *per se*, but I thought you might still be able to shed some light on my problem—I hope, anyway.

I recently purchased two rack-mounting kits from Teac (RM-23 and RM-24) to be used with my Teac A-2300SX and A-2340SX respectively. My problem is that no instructions for proper mounting techniques came with either the rack mounts or the recorders. I know this is a simple procedure, but I don't want to take the chance of mounting such expensive pieces of equipment incorrectly or damaging them by misplacing a screw.

Could you look into this for me, and perhaps pass along some helpful hints? Your response, and most important, any information gained, will be greatly appreciated.

—Dale Dvorak
Chelsea, Iowa

The old adage which states that one picture is worth a thousand words certainly holds true in your case! When the picture is, of course, the one that serves as a source of information on the instruction sheet that is usually found in the RM-23 and RM-24 rack mounting kits. Lewis Ross, Customer Relations Manager for Teac Corporation—while he couldn't fathom why the kits you bought were missing instruction sheets—assured us that you would be sent the necessary instructions by contacting him directly. He also commends your desire to do it right the first time. Please contact Mr. Ross at Teac Corp. of America, 7733 Telegraph Rd., Montebello, California 90640.

Setting Your System Straight

I just purchased a 9-band real-time analyzer to set our P.A. system with. However, setting the P.A. "flat" sounds pretty bad. Could this be

because we set the P.A. in the afternoon when the club is empty? I noticed on the Shure M615 analyzer that I experience a 3 dB per octave rolloff beginning at 1 K. Shure calls it "house curve." When an analyzer sets a system "flat," is it to eliminate the peaks that cause feedback, or to make the system sound good? I've been told to analyze the system after a good-sounding night and mark the position the LEDs are in and set it the same in every club—will this work? How are sound changes dealt with in concert dates where the changes occur right before showtime? I realize your ears must be the final judge, but the real-time analyzer must be of great assistance when used properly. Can you straighten me out?

—David Cline
Kalamazoo, Mich.

Poor Paul Bugielski! Faced with the tip of the equalization iceberg, Paul (Product Manager—Microphones and Circuitry Products for Shure Bros., Inc.) had to decide whether to give you a "simple" answer (no mean feat in this area) or to pen the tome required to answer all your points in the detail they deserve. Faced with our spatial limitations and in the interest of immediacy, Paul tackled the impossible and chose the former.

To help you better understand the position you find yourself in, perhaps some background is necessary. To equalize perfectly "flat" is valid for playback-type sound systems (i.e., home hi-fi setups, studio monitors, etc.). In such situations you theoretically have an audience of one, which does not move around very much, so you can optimize the frequency response with your equalizer for that particular spot.

However, when equalizing for a "live" sound situation, where there is an audience involved, you must take into account the attenuation by air of the high frequencies and changes in the absorption factor caused by the addition of an audience. You see, the more people in a room, the more air displaced. More people equal more absorptive material eating up your high frequencies. The concept of "house curve" was arrived at by engineers searching for a "norm." It's the "average American" theory of the audio industry. The house curve setting approximates what a "normal" person would hear in a "normal" listening situation (unfortunately, not many situations you encounter day to day are that normal!). For optimum results with your M615, Paul strongly suggests that you operate it in the house curve setting. This concept allows you to optimize the equalization for the greatest number of people. Just keep in mind that there is no ideal possible—you must settle for something different.

*As for your question regarding an "all purpose" setting for the LEDs, you must realize that since no two situations are exactly alike, no one setting can answer every equalization need. Unfortunately, for those who must deal with them, changes usually do occur right before showtime and there is no magic formula for dealing with them. One method is to do a quick (45-60 second) sound check right before the show begins with the audience present. Run pink noise through the system to tweak it up a bit—*after *warning the audience to expect a loud noise!*

Finally, to give you a greater perspective on the entire subject, Paul recommends you read Bob Schulein's definitive article "In Situ Measurements and Equalization of Sound Reproducing Systems," which was

published in the Journal of the Audio Engineering Society, *April 1975, Vol. 23, No. 3. This should begin to "straighten you out," but don't underestimate the experience you're getting working it out on your own.*

Cleaner Echoes

Can dbx noise reduction be used to reduce the noise inherent in the Echoplex or Roland Space Echo systems? If not, do you have any suggestions on how to make them cleaner?

—Timothy R. Hale
President
Horizon Recording Studios
Horizon Entertainment Corp.
Ripon, Wisc.

dbx noise reduction systems are currently being used to quiet Echoplex and other echo/reverb type delay systems in recording studios and on stage. The companding process results in a total delay package with virtually no added noise and wider dynamic range handling capability. There is some coloration depending upon the complexity of the program, but this tends to enhance rather than detract from the overall system performance on most program materials.

Companding as used here is defined as the encoding, by compression, of original program materials, echo/reverb processing, then decoding through expansion. Companding changes the reverb time and envelope interaction. dbx tape noise reduction systems result in a 2 to 1 reduction in reverb time. In many cases, this can be made up by resetting the delay system. An alternative is to use a pair of dbx Model 118 dynamic range enhancers instead. They have variable ratios. Setting a pair of dbx 118s to compand 1.2 to 1.5 is very effective.

dbx noise reduction systems and dynamic range enhancers also are used with other types of delay systems, such as time delay systems designed for large sound reinforcement installations. The same benefits of wide dynamic range handling and no noise are also realized.

—Harold Cohen
Marketing Manager,
Professional Products
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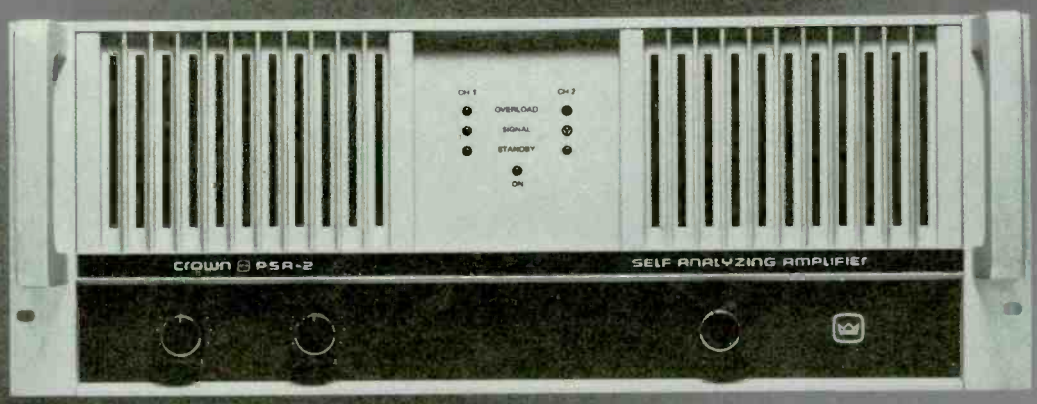

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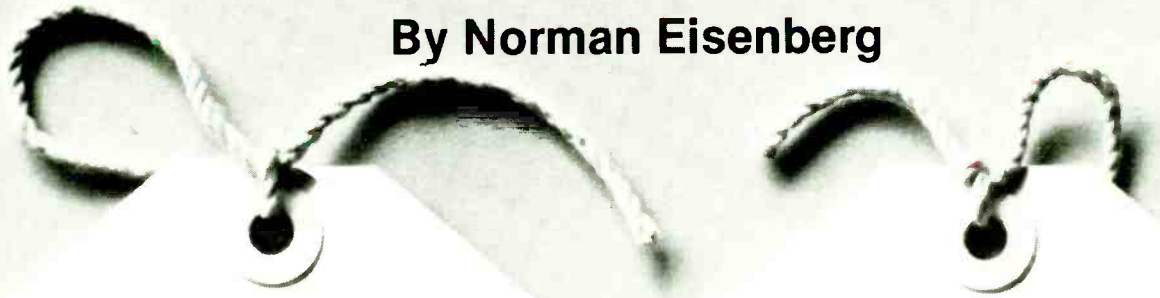
THE PRODUCT SCENE

By Norman Eisenberg



NEW EVENTIDE HARMONIZER

Eventide Clockworks has introduced its new Harmonizer model H949. This device can change the pitch of an input signal by three octaves (one up, two down). It has two outputs each with 400 milliseconds of delay, frequency response up to 15 kHz, and a rated S/N of 96 dB. In addition to pitch change and delay, the H949 has capabilities for flanging, repeat, random delay for automatic double tracking, and an entirely new effect called reverse. The micropitch change function allows extremely precise stable settings, said to be ideal for tuning in a late edition to a mix, or for adding

body to a vocal or instrumental sound. There is also high and low equalization of feedback. The user can select one of two different algorithms for handling pitch change glitches. A four digit pitch ratio readout, red/green LEDs for function select, and an input level indicator showing present/normal/limit status helped to make the H949 Harmonizer simple to operate. Delay is selected by incremental push buttons. Pitch change is controlled either by a knob in the manual mode or by a keyboard which varies the pitch in discrete musical steps. Rear panel connectors are XLR type with tag strip for external control and capstan drives (the unit can be used to control the speed of a tape machine). The H949 may be operated on 115 or 230 volts AC and occupies 3½" of standard rack space. Price is $2400.

CIRCLE 1 ON READER SERVICE CARD

TWO FROM NUMARK

Numark Electronics Corp. of Edison, N.J. is offering its model DM 1700W, described as a professional sound studio master mixer/equalizer flexible enough to be used with almost any auxiliary input in a preamp, integrated amplifier or receiver. The equalizer has six frequency ranges and an EQ-defeat switch. Inputs include two phono, four line and two mic. Included are pan pots, variable headphone level control, two VU meters, two peak-level LEDs and a two-position talkover switch. Price of the DM 1700W is $459.50.

The model UC 935 is a Numark condenser cardioid microphone with rated response from 30 Hz to 16 kHz. Sensitivity is −68 dB/1 kHz, unbalanced line. Impedance is 600 ohms, XLR type to phone plug connectors. A foam windscreen is included. Price of the microphone is $59.95.

CIRCLE 2 ON READER SERVICE CARD

AB SYSTEMS AMP

A new slim line medium power amp, the model 105 is available from AB Systems, Fair Oaks, Ca. The model 105 is rated for 50 watts output per channel into 8 ohms, or 75 watts output per channel into 4 ohms. It may be bridged. Distortion is rated 0.05% with no greater than 0.15% under any conditions under the full range from 20 Hz to 20,000 Hz ±0.25 dB. Rated noise figure is 104 dB below rated output. Designed to fit a standard 19" rack the model 105 requires only one rack height (1¾") of vertical space and eleven inches of depth. Optional features include front panel level controls and headphone jacks, rear panel level sets are standard. Input connectors are dual XLR or screw terminals with quarter-inch phone jacks standard. Output connectors are dual five-way binding posts.

CIRCLE 3 ON READER SERVICE CARD

GRAPHIC EQ WITH REAL-TIME ANALYZER

A 10-band graphic equalizer which incorporates a real-time spectrum analyzer has been announced by Audio Control of Seattle. Featuring a 99-LED display the analyzer portion of the unit monitors changes in each of the 10 bands continuously providing a "light show" as well as representation of the sound spectrum. Fast and slow decay rate controls, input level control, switchable metering range and a sound pressure level mode are all included. A built-in pink noise generator makes use of three separate sub-generation circuits for smooth output over all ten octaves. Use of the generator with a calibrated microphone/preamp (available separately) allows the user to equalize the listening room and determine sound pressure levels.

The octave equalizer section features stereo paired sliders each with a ±15 dB range. The device also includes a subsonic filter with an 18 dB per octave circuit, and a Phase Correlation Rumble Filter which reduces rumble by effectively combining the stereous signal below 500 Hz. This technique also has claimed to result in lower IM distortion.

CIRCLE 4 ON READER SERVICE CARD

EUMIG HIGH END CASSETTE DECKS

New from Eumig USA is the model FL-1000, a three-head, front-loading cassette deck with complete metal capabilities, able to play, record and erase the new metal particle tapes. The FL-1000 also incorporates Eumig's opto-electronic capstan control and transport, operating without a fly wheel. By this system, the deck corrects its speed accuracy 15,000 times per second with a rated wow and flutter of 0.035% WRMS. Also included is Eumig's microprocessor control for smooth fast access to any point in the tape with CMOS logic control. Also included is a feature that provides control and calibration for optimum bias plus Dolby noise reduction for all three kinds of tape that may be used in the deck. A three-head system, the deck provides for tape source monitoring. The test frequencies built into the unit are at 400 Hz and 16,000 Hz. Price was not announced at press time.

CIRCLE 5 ON READER SERVICE CARD

NEWS FROM NEVE

The Neve series of limiter-compressors are designed to provide limiting and compressor facilities suitable for broadcasting and recording applications. The units may be linked for stereo multi-channel operation, and since the compressor samples the signal ahead of the amp, the mean output level may be raised after compression. Switchable attack and recovery times are provided. All units are designed for standard 19″ rack mounting and have 3½″ panel height. Limiting and compression controls are arranged in separate sections so that each section may be used individually or in combination. A bypass switch provides overall control and switches both sections in or out of the circuit. Four configurations are available. The model S33609 provides double l.c. with integral p.s.u. The model S33610 provides single l.c. with integral p.s.u. The model S33611 provides double l.c. without p.s.u. The model S33612 provides single l.c. without p.s.u.

Also available from Neve is the Lyrec TR532 multitrack recorder. Originating in Europe, this machine is now available in the U.S. and Canada. Among its features are track solo, spot erase and vari-speed. A user-oriented remote control is available, and an optional microprocessor controlled auto locator can memorize up to sixteen tape positions.

CIRCLE 6 ON READER SERVICE CARD

SENNHEISER OPEN-AIR HEADPHONES

Weighing only seven ounces and rated for audio response of 16-20,000 Hz is the new model HD-430 headphones from Sennheiser. According to the manufacturer the new headphones feature a newly developed diaphragm design, the use of a more powerful magnet that is only one-third the weight of conventional materials and a total harmonic distortion level which is half that of earlier models. The HD-430 also is the first Sennheiser headphone that combines an open air design and circumaural ear cushions. Retail price of the HD-430 is $119.

CIRCLE 7 ON READER SERVICE CARD

MICMIX REVERB

Claimed to be the first reverb to offer natural sound of a "live" studio chamber or the qualities of a plate is the XL-305 from Micmix. The device features a stereo enhancement of the reverberant field, including full stereo imaging of mono signal. Included are the options for reverb/dry signal mixing, plus LED peak signal indicators, and a four band peak/dip EQ on each channel. Input level and output gain controls are front panel adjustable. Additional front panel features include auxiliary in/out connectors and mono mix switching of reverb inputs or outputs. A new Sound Chamber design has been incorporated into the XL-305 which is self-contained within its 3½" rack enclosure. The design is claimed to withstand the rigors of heavy road usage without special handling or lockdown. Isolated from acoustic feedback and mechanical shock or vibration, the XL-305 can be mounted in virtually any location or position without affecting performance. Announced price is $1,195.

CIRCLE 8 ON READER SERVICE CARD

TANDBERG METAL CASSETTE DECK

Claiming to hold the lead as the producer of the world's first "metal-ready" cassette recorder, Tandberg has announced its TCD 440A cassette deck which incorporates the "DYNEQ" record equalization circuit together with the company's Actilinear recording system. Says Tandberg, "The new circuitry represents not simply a technical refinement, but a fundamentally new approach to dealing with the high frequency limitations inherent in the cassette medium."

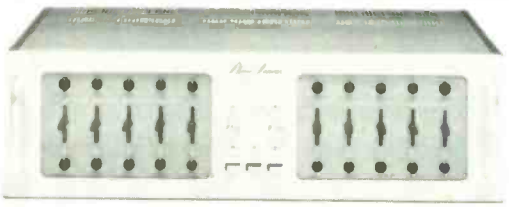
The DYNEQ feature of the TCD 440A is designed to automatically adjust the recording pre-emphasis to maximize treble response while minimizing treble distortion. In addition to this feature the new Tandberg deck includes a new erase head that produces 80 dB erasure at 1 kHz and more than 60 dB of erasure at 100 Hz. Frequency response is rated at plus or minus 3 dB from 30 to 20,000 Hz, and S/N ratio is 70 dB (A weighted) using top quality ferric, chromium dioxide or metal tapes. The record and playback heads are completely separate and a 10 kHz test oscillator is provided to optimize performance with all the tape types. Bias adjustment controls for all tapes are on the front panel. An instant comparison between input and recorded signal is available with a push button. The built-in Dolby NR system includes an FM position that permits monitoring/recording Dolby FM broadcasts with the correct deemphasis. A logic control three motor dual capstan transport system offers fast buttoning including the flying start capability. Professional slider controls are provided for both input and output level. An infrared wireless remote control is available. The deck will retail for $1600.

CIRCLE 9 ON READER SERVICE CARD

PHASE LINEAR ANNOUNCES NEW ITEMS

From Phase Linear comes news of its model 300 Series Two power amplifier, FTC rated at 120 watts minimum RMS per channel, both channels driven into 8 ohms with no more than 0.009% THD. TIM distortion is rated at less than 0.005%. The model 300 utilizes direct coupled, common base, mirror image drive circuitry and a full complimentary output stage which is claimed to provide superior linearity, bandwidth and slew rate. Of rack mount width, the model 300 Series Two takes 3½" of height and retails for $450.

Also from this company is word of a new parametric equalizer, the model 1100. This device provides five band parametric EQ on center frequencies of 63 Hz, 250 Hz, 1000 Hz, 4000 Hz, 16,000 Hz. The frequency range is given as a 9:1 ratio (continuous with center detent). The bandwidth range covers from 0.18 octave to 1.8 octaves (continuous).



Amplitude range is ±12 dB. With separate overall level controls and overload indicators the model 1100 has a maximum gain of plus 6 dB. It features a tape monitor loop with status indicator and a bypass switch with status indicator. Price is $600.

A third item from Phase Linear is the model 1200 Series Two real time analyzer. This unit provides twelve bands on ISO octave centers covering the range of 16 Hz to 31.5 kHz. Its filter bank consists of twelve individual four pole active filters meeting ANSI standards. There are twenty LEDs per column which are perfectly aligned with a display graticule for accurate amplitude resolution. 40 dB of amplitude display range in calibrated two dB steps are provided with a scale multiplier push button for selecting 1 dB steps to get added resolution. The model 1200 has a built-in pink noise generator which is calibrated for response within ±1 dB from 20 Hz to 20,000 Hz. Also included is an omnidirectional condenser microphone individually calibrated. The price of the model 1200 is $800.

CIRCLE 10 ON READER SERVICE CARD

AMS DIGITAL AUDIO PROCESSOR

From Advanced Music Systems of England comes news of the new DMX 15-80 Digital Audio Processor. This device makes use of microprocessor techniques for adapting to extra effects such as digital reverberation, pitch change, and so on, and is said to permit itself, in addition, to be expanded into new realms of signal processing, hitherto not available. The circuit employs 15 bit digital encoding, which permits a 90 dB dynamic range without the use of compression/expansion techniques. The device has a bandwidth of 18,000 Hz, which is said to remain constant regardless of the amount of delay selected. A keyboard is used to enter commands to the microprocessor, for delay requirements and for storing or recalling information from the unit's nine memory locations. This technique permits the operator a very fast method of changing delays and also makes available a controlled repeatability. Another feature of the DMX 15-80, are the so-called "nudge" buttons which will cause the delay to sweep up or down in steps of only 25 microseconds, making the sweep click free and enabling flanging or "tunnelling" effects to be produced. In addition the unit has an analog side with feedback and high pass filter controls for repeat echo functions, plus facilities for switching between the original and delayed program as well as mixing the two in any ratio.

CIRCLE 11 ON READER SERVICE CARD

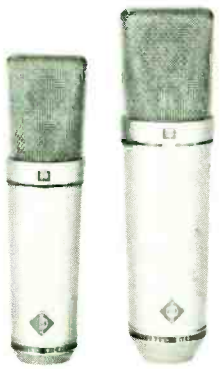
PHASE CHECKER

Sounder Electronics of Mill Valley, Ca. has developed a new audio testing instrument called a Phase Checker. The device is designed to determine the phase polarity of all acoustic transducers (speakers as well as microphones) in addition to cables, amps, crossovers and other audio electronic equipment. Sounder points out that its product, the model 500 can help avoid mistakes in the wiring of sound systems or any parts in a sound system which could result in bass cancellation, as well as other undesirable distortion effects due to incorrect phasing. An electronic device, the instrument operates on three nine-volt batteries and includes LEDs for indications, as well as a built-in pulse generator and a phase detector. Price is $495.

CIRCLE 12 ON READER SERVICE CARD

NEUMANN CONDENSER MIC

Termed "revolutionary" is Neumann's model U 89 condenser microphone, latest of the fet-80 48-volt "phantom powered" series. About 15 percent smaller than the model U 87, the U 89 has a new condenser capsule that, for the first time, provides exposed capsule elements, including the two gold sputtered polyester membranes, all of which are set at zero-volt potential. The result, says U.S. distributor Gotham Audio (New York and Hollywood) is "far greater security against capsule failure resulting from humidity, human breath, and accumulating dirt." The new U 89 features five directional characteristics: cardioid, figure-8, omnidirectional, hyper-cardioid and wide cardioid. With ten transistors, the U 89 boasts an undistorted sound pressure tolerance that is up by 12 dB.



CIRCLE 13 ON READER SERVICE CARD

TAPCO ELECTRONIC CROSSOVER

The model CP-X from Tapco is an electronic crossover which includes 18 dB/octave slopes, capability for both biamp and triamp applications, balanced and unbalanced operation, front panel overload LEDs, and many other features. Frequency response is rated within ±½ dB from 20 Hz to 20,000 Hz. Signal-to-noise ratio is given for a one-volt output as 90 dB and for maximum output as 110 dB. Distortion is less than 0.05%. Slew rate is greater than 13 volts per microsecond. The crossover range may be adjusted from 90-1600 Hz (4 octaves) or from 900-16,000 kHz (4 octaves). The unit weighs 10 lbs. and is of rack mount size, 3½" high; operating on standard 120 volt AC line.

CIRCLE 14 ON READER SERVICE CARD

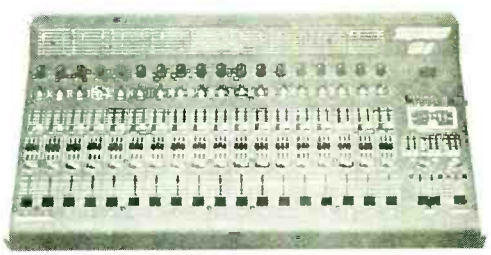
ROUTER/AMPLIFIER

Sometimes called an "electronic patch panel" is the model ARA-1612 router-amplifier from Ramko Research, Inc. of Rancho Cordova, Ca. The unit allows sixteen mono or eight stereo (or combinations of mono and stereo) audio sources to be fed—simultaneously or individually—to up to twelve outputs with no interaction between locations. According to Ramko, with the ARA-1612 the user can forget about such problems as signal degradation due to branching or impedance mismatches; operator interruptions due to patch panel limitations; and stereo phase reversal caused by inserting a patch cord backwards. The ARA-1612 has individual, gain-adjustable, balanced input amplifiers; local and remote lighted output status displays; dual, automatic switchover; power supplies; and it can be expanded to 45 in and as many out as needed. A color brochure is sent on request.

CIRCLE 15 ON READER SERVICE CARD

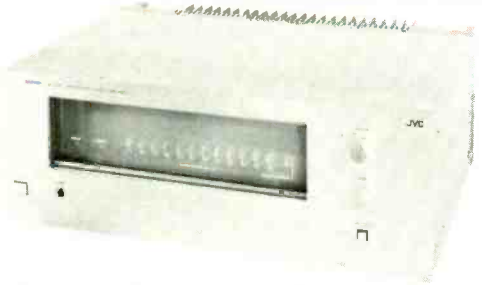
UNI-SYNC ANNOUNCES NEW ITEM

The model 180S is a professional mixing console which provides for 18 inputs and a two-channel stereo output with a mixing option if desired. The separate stereo house and stereo echo buses plus a mono-monitor output bus are also included. Each input has a post fader and EQ patch point. Each input also has three-knob EQ. Mic inputs are balanced, low impedance types, and there also is an unbalanced high impedance mic line input with continuously variable 30 dB gain trim for both inputs on each channel. Each channel also features separate stereo pan of echo and program. The model 180S also includes two built-in reverb units with separate stereo return controls for the house and monitor outputs, as well as patch points for alternate use of external echo/effects units. A built-in one watt headphone amp is also included.



CIRCLE 16 ON READER SERVICE CARD

JVC MONO POWER AMPLIFIER



JVC has introduced the model M-7070, a monophonic power amplifier with a class-D power supply and a DC amp construction with three differential amplifier stages. The class-D power supply, with efficiency as high as 80%, is completely free from thermal loss. Further, it is compact and lightweight and it offers rapid responses and high stability. Because the class D power supply has extremely low internal impedance, the M-7070 can produce power inversely proportional to the load impedance, thus 240 watts into 4 ohms, 120 watts into 8 ohms, 60 watts into 16 ohms. The nominal 8 ohm rating is 120 watts, minimum RMS across the audio band with no more than 0.003% THD. The amplifier features twelve peak power indicators for instant check of output power in watts, selectable switching for two speaker systems, Cannon-type input connector provided in parallel with the subsonic input terminal and a headphone jack for monitoring. Approximate retail price is $1599.95.

CIRCLE 18 ON READER SERVICE CARD

PHASE LINEAR CASSETTE DECK

Phase Linear has entered the cassette recorder field with a high-end model of interest to serious recordists. The new model 7000 is a three-head design with metal tape capability and a built-in microprocessor that automatically adjusts the bias and EQ for each tape used. A memory feature also may be used to recall the data as needed for nine different tapes.

The 7000's transport uses two motors in a direct-drive, dual-capstan system. Capstan drive is handled by a quartz phase locked loop brushless DC motor. A coreless DC motor is used for reel drive. At presstime, full specs were not available except for wow and flutter of 0.03 percent WRMS. Expected price is $1349.95.

CIRCLE 19 ON READER SERVICE CARD

MORE SIGNAL, LESS NOISE

In a sense, the name of the game for the entire audio field is "more signal for less noise." Recent efforts to accomplish this often self-contradictory goal have been legion. Most sound enthusiasts are familiar with noise suppressors, filters, volume expanders, and so on, not to mention new recording techniques such as direct to disc and digital.

The latest in this area are a new Dolby technique and a new dbx system. The Dolby technique called HX extends recording headroom in conjunction with Dolby B noise reduction in a cassette recorder. It permits recording at frequencies of 10 kHz and above at a level 10 or more dB higher than is currently possible. At the same time the performance at low and middle frequencies is said to be optimized for minimal distortion, modulation noise and drop out effects. Dolby HX works by automatically and continuously varying a recorder's bias level and EQ, to suit the signal being taped while avoiding the effects of tape saturation. Claimed to be effective with any tape formulation for which a given recorder is set up, the HX technique adds an improvement that is inherent in the recording process, so that the resultant cassette requires no special decoding or playback processing, other than regular Dolby NR.

Dolby says that for its HX system to be added to existing recorders would cost the manufacturer about ⅓ the cost of present Dolby NR circuitry. Existing Dolby licensees may add HX with no further royalty or licensing charges.

The dbx system concerns disc recording, regardless of how the original tape was made. An encoder is introduced at the record cutter which is said to improve disc signal to noise by as much as 30 dB, resulting in dynamic range and quieter disc surfaces. To play such a disc requires a new decoder. The dbx company already has produced the first encoded discs and has announced an initial release list of nineteen albums, mostly classical. Disc prices are $8, $12, and $16 depending on the original label. The playback decoder costs $109.

I have heard brief demonstrations of both the Dolby HX and the dbx encoding systems. Both sounded great, and very much "as claimed." Of the two the dbx system made a more dramatic impact on me, since it suggested a quality of disc playback that was surprisingly close to master tape quality.

MUSICAL NEWSICALS

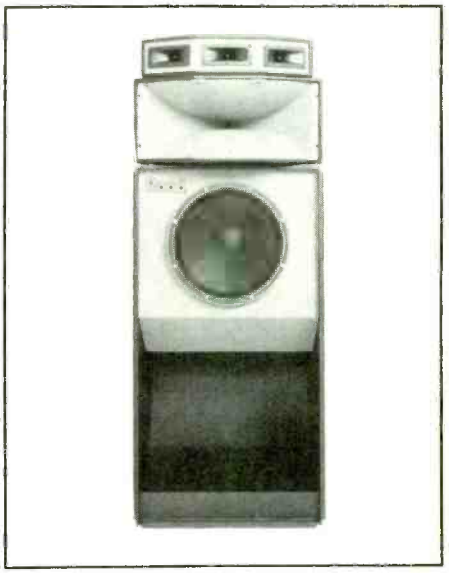
SOUND REINFORCEMENT EQUIPMENT

Fender Musical Instruments has expanded its offerings in the P.A. field with a new mixing console, the M12. The new mixer is a 12-input unit with excellent input and output flexibility and provision for interfacing to other mixers. Any of the twelve inputs may be assigned to any of the two submaster buses or four output buses. Each input has provision for high-level patching of an external signal processing device, and high impedance line level inputs are provided for each of the submasters and output channels as well as the twelve input channels. The submaster and master buses all have fast attack/slow release limiters built in for amplifier and speaker protection; the limiters have variable threshold controls and LED indicators. The M12 has three monitor mix buses plus an independent cue function, and a talkback function is built in to communicate with the program, monitor or cue buses without tying up an input channel.

CIRCLE 20 ON READER SERVICE CARD

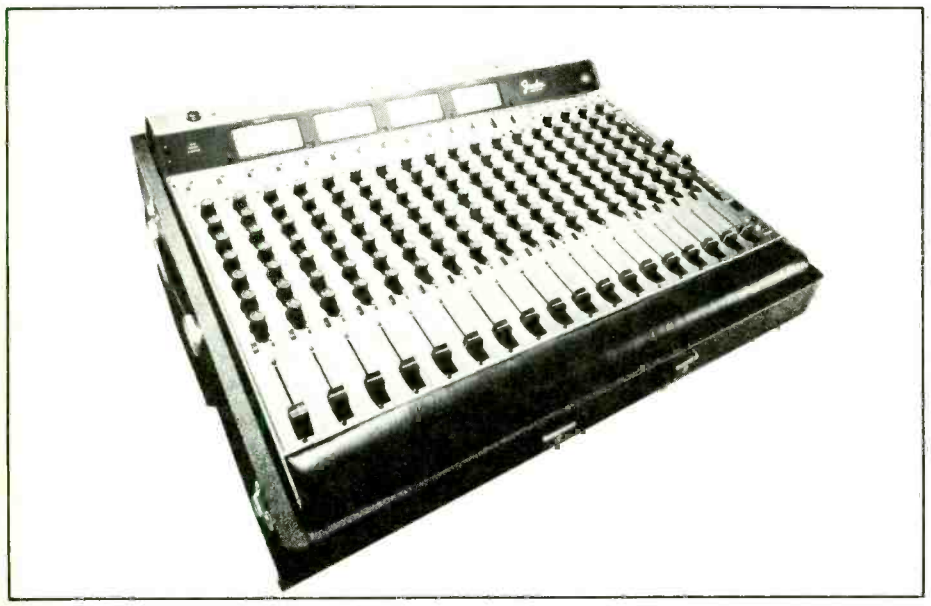
New from Acoustic Control is the Model 924, an eight input stereo mixer. Each input channel features high and low level inputs, in/out patch point for effects devices, gain switch (0, −20 and −40 dB settings), bass, mid and treble EQ (±18 dB), echo send, monitor send, pan pot, main fader and a dual sensing LED overload indicator. The two main output channels have master level faders, master reverb/effects level controls, nine-band graphic equalizers and eight-segment light bar level displays. The unit is housed in a rugged wood and fiberglass road case and measures less than three feet wide and has a shipping weight of less than 55 pounds.

CIRCLE 21 ON READER SERVICE CARD



Road Electronics, who were well known a few years ago for their very well-built instrument amplifiers, have now entered the sound reinforcement field with a complete line of P.A. components. The line includes bass enclosures, horn enclosures and high-frequency arrays, all of which were designed to complement one another to provide a wide range of custom-built systems for any user need. The new Road line was engineered to produce smooth response over a very wide frequency range at any volume level at a competitive price.

CIRCLE 22 ON READER SERVICE CARD



Shure Brothers Inc. is continuing its recent expansion into sound reinforcement speakers with the introduction of the model 701 speaker system. The new model is a computer-assisted design which is said to yield big speaker performance in a compact, easy-to-handle package. A unique feature of the 701 is its variable treble dispersion. In the mouth of the system's treble horn is a knob which alternately blocks off or opens up the side section's of the horn to either limit the dispersion to 60° horizontally or open it up to a full 120°. This feature makes the 701 suitable for a wide variety of applications in varying room sizes and shapes. Low frequency output of the system comes from a 15-inch woofer in a ported (bass reflex) enclosure. Power handling of the system is rated at 150 watts continuous program, and sensi-

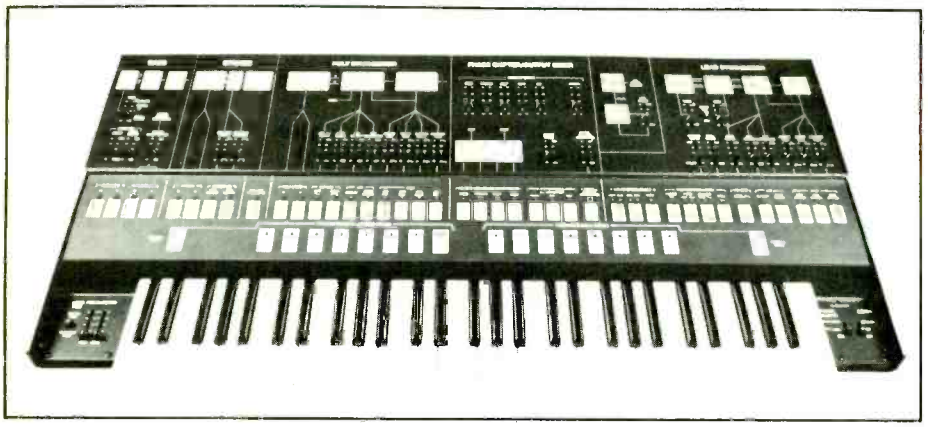
tivity is given as 100.5 dB SPL at 4 feet with a 1 watt input. System impedance is 8 ohms. Overall dimensions of the system are 27⅞" H x 23" W x 15 13/16" D, and the system tips the scale at a modest 58 pounds.

CIRCLE 23 ON READER SERVICE CARD

SYNTHESIZERS

ARP Instruments, Inc. has introduced the ARP Quadra, a microprocessor-controlled system which is said to be the fastest user-presettable polyphonic synthesizer on the market. The name "Quadra" comes from the fact that the instrument is actually four synthesizers—a bass synthi, a string synthi, a polyphonic synthi, and a two-voice, touch-sensitive lead synthi—within a single system. The microprocessor control system gives the musician the ability to write, edit, store and activate programs to control the sounds of four synthesizers in "live" performance. The bass synthesizer is controlled from the lowest two octaves of a five-octave split keyboard, and can be programmed for sounds ranging from electric bass to string bass. The string synthi section produces the famous ARP string sound, while the polyphonic synthi section yields brass, piano and synthesizer sounds and quick change of envelope control parameters at the touch of a switch. The lead synthi section is a two-note variable synthesizer with pressure-sensitive control of dynamics over a three octave or five octave range depending on whether the bass synthi is being used. A sequencer is built in which permits instant sequential effects; a sequence played in real time can be held and repeated while the player adds string or polyphonic lines on top of it. The microprocessor allows the musician to program up to sixteen programs before a performance—these are recalled instantly by touching a button.

CIRCLE 24 ON READER SERVICE CARD

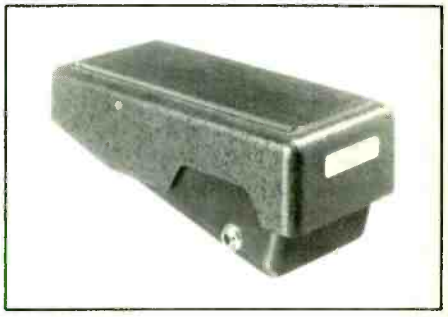


SYNTHESIZER ACCESSORIES

An interesting new approach to the design of musical keyboards has been invented by a New Mexico keyboardist named Mel Sohler. Sohler's concept is to abandon the traditional format of white keys for "natural" notes and black keys for the sharps and flats, and to replace it with a symmetrically-ordered sequence of keys. The twelve semitones of each octave are divided into four groups of three keys, a raised black key and two adjacent white keys. This arrangement of keys produces simple, repeating patterns for any given chord pattern regardless of where the pattern is played; transposing and modulating are thus almost automatic with the Sohler keyboard. The physical layout of Sohler's design is also quite unusual; rather than the conventional design for the black keys, Sohler has divided the black keys into two rows of smaller raised keys which are connected. This allows the musician much greater flexibility and facility in his fingering since it affords him access to the white keys behind as well as in front of the primary black keys plus the alternative of playing the auxiliary keys for the black key positions. To complement the new keyboard design, Sohler has developed a new, revised musical staff notation which corresponds to the physical design of his keyboard. In the new notation, each note has a uniquely designated staff position eliminating the need for sharps and flats in the notation. In the new notation, the lines of the staff correspond to the raised black keys, which are C#, E, G and A#, and there are two distinct positions between the lines (the note either rests on top of the line or hangs just below it) corresponding to the flat, white keys on either side of the black keys. The physical dimensions of the keyboard are virtually identical to a conventional keyboard, making a retro-fit installation more convenient. The Sohler keyboard is not being manufactured at this time (Sohler is looking for an interested manufacturer), but all interested parties are invited to correspond with Sohler about his invention and with regard to the possibility of commercial availability.

CIRCLE 25 ON READER SERVICE CARD

Sequential Circuits Co. has recently announced two new accessory products for synthesizer users. The first of these is the Model 840 Voltage



Pedal. This unit produces a 0 to 9 volt control signal in response to pedal position; the customary application of a control pedal like this would be to control a VCA or VCF for volume pedal or wah pedal effects. The other new product is the Model 700 Synthesizer Programmer which features single plug interface with many synthesizers including the 360 Systems Spectre Guitar Synthesizer (which carries

the mating plug as standard equipment) or an ARP which has been modified by ARP's custom engineering group or the customer. The Model 700 allows most of the synthesizer's functions to be pre-programmed to provide pushbutton patch changes for maximum versatility in performance.

CIRCLE 26 ON READER SERVICE CARD

MUSICAL INSTRUMENTS

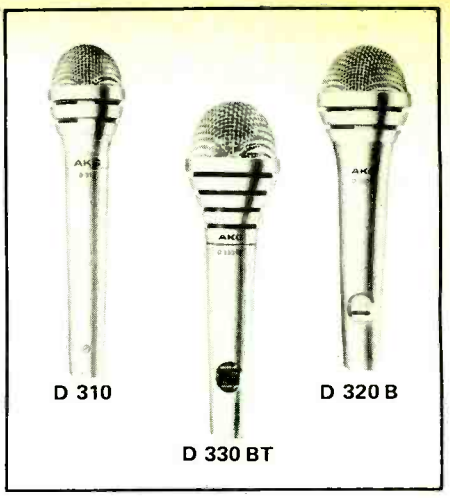
Guild Guitars has announced two new additions to their line of solid body electric guitars, the S-70D and the S-70AD. Both new models share the same body shape and dimensions as the company's popular S-300 and S-60 guitars. Both new models feature a curved, wide-fretted fingerboard, sealed tuning machines, an Adjusto-Matic bridge and a solid brass tailpiece. On the electronic side, the models utilize three DiMarzio SDS-1 pickups with a five-position pick-up selector switch and two phase switches for an incredible range of tonal quali-

ties. The DiMarzio pickups were chosen for their biting sound and high output level, and the relatively low amount of magnetic "string pull" the pickups exert on the strings. Most high output pickups exert rather a large amount of pull on the strings leading to tuning problems and double-tone problems. The S-70D has an all-mahogany body with mahogany neck and rosewood fingerboard, and is available in sunburst, cherry, walnut, natural mahogany, black and white finishes. The S-70AD uses an ash body with maple neck and is available in sunburst or blond body finishes.

CIRCLE 27 ON READER SERVICE CARD

MICROPHONES

AKG Acoustics has announced the introduction of three new microphones designed specifically for hand-held use by vocal performers. The major shortcoming of most high-quality mics in this application is their susceptibility to handling noise. The new AKG models were designed for maximum suppression of handling noise without any compromise in sound quality, so that they are just as suitable for miking musical instruments as they are for vocal applications. All three models are dynamic type microphones, which typically are more rugged and can handle higher sound levels without distortion or damage than condenser or ribbon type mics but which are often more susceptible to handling noise because of their relatively high-mass diaphragms and voice coils. To counter this characteristic, AKG uses very light diaphragm structures, which also improves frequency response and response to musical transients, and a novel type of elastic mount for the capsule assembly. The new capsule suspension was designed to give almost ideal elastic characteristics; for small displacements, such as those caused by handling, the suspension is highly compliant ("soft") to damp the transmission of vibration from mic body to capsule, while for large displacements, such as would be caused by dropping the mic, the suspension is stiff enough to prevent damage to the capsule which might be caused when the capsule contacts other parts of the microphone. All three models from AKG are uni-directional types, although their individual polar characteristics differ somewhat; the top-of-the-line D 330 BT is a hypercardoid pattern, while the D 320 B is a cardioid that tends toward a hypercardioid pattern at higher frequencies and the D 310 B is a conventional cardioid. All three models are housed in injection molded zinc alloy bodies with stainless steel mesh grills, integral pop filters, and a special protective basket over the capsule to prevent physical damage even when the mic is dropped nose down. The D 330 BT features a very thin, light diaphragm for extended frequency response with a slight presence peak from 4 kHz to about 8 kHz. A unique feature of the D 330 BT is the use of a second capsule assembly which is *not* exposed to sound from outside the microphone; rather, it only picks up physical vibrations of the mic such as handling noise. The output of this second capsule is connected out of phase with the main capsule to provide 30 dB of electrical noise rejection to the already excellent



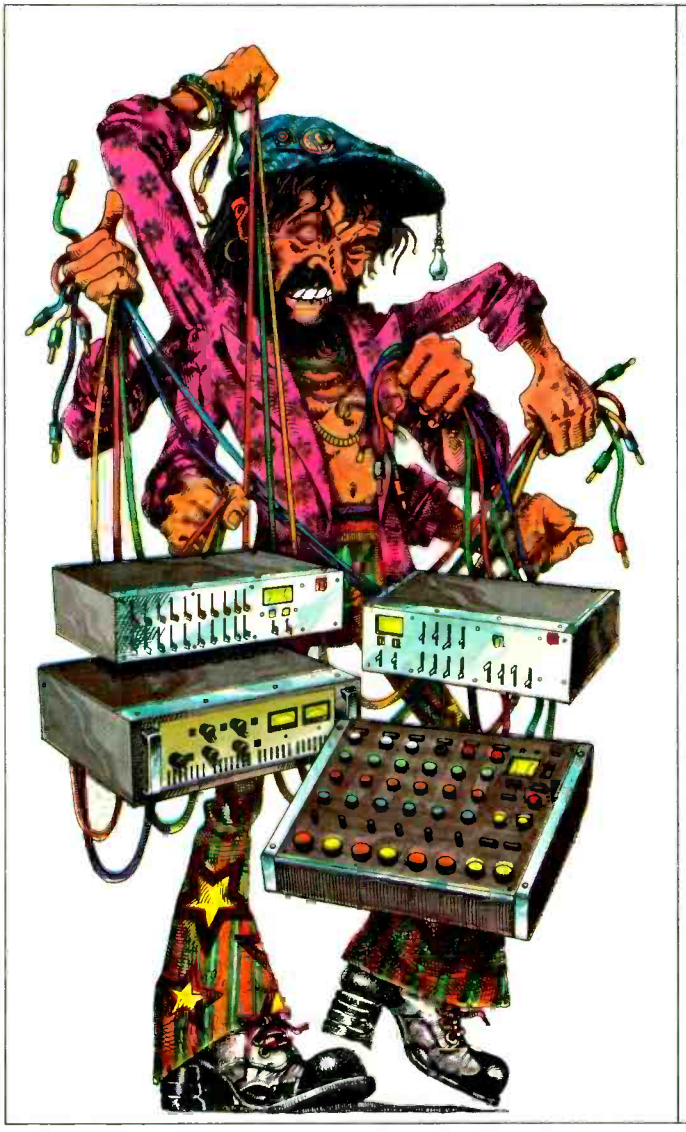
performance of the suspension mount. Additionally, the D 330 BT has a three-position bass rolloff switch and a three-position treble boost switch to tailor the characteristics of the mic to a variety of applications. The D 320 B is the middle model in the trio, and it features the same low frequency roll-off function as the 330 although it lacks the high-frequency boost switch. Also eliminated from the design is the acoustic compensation system with its second capsule, although the D 320 B does have a humbucking coil to cancel any electromagnetic hum that the voice coil might pick up from outside the mic. The "basic" model in the series is the D 310, which features excellent frequency response and an extended low frequency range without the response-tailoring switch of the other models.

CIRCLE 28 ON READER SERVICE CARD

MUSICAL INSTRUMENT ACCESSORIES

From Hammond Industries, Inc. comes news of the Klark-Teknik DN70 Digital Time Processor. The DN70 is a single input device with three, independent, straight digital delay outputs plus a fourth, mixed output which can be used as a comprehensive delay-effects output. The DN70 is available with one of three maximum delay options of 163, 326 or 652 milliseconds. A digital sampling rate of 50 kHz yields frequency response to 15 kHz at any delay setting, and the quasi-15-bit digital word length and careful design of analog-to-digital and digital-to-analog converters makes a dynamic range of 90 dB possible. The first three output channels of the DN70 are straight delay channels with LED readout of the delay time on the front panel; a special lock-out function is provided to

THE LONG AND THE SHORT OF SOUND REINFORCEMENT.



You know about the long part. Separate components can keep your hands full, what with the extra help and time needed to get your sound reinforcement act together.

Now for the short part. The Yamaha EM-200 and EM-300 stereo output integrated mixers. They leave you free to concentrate on the creativity of your job, not the mechanics of it.

You get the mixer, power amplifier, 9-band graphic equalizer, echo and reverb control **all in one unit**—great flexibility with options to expand and enlarge.

The EM-200 and EM-300 are ideal for small to medium size reinforcement applications, wherever you need a precisely placed, superbly clean and well-defined sound from a compact source that is easy to set up and operate.

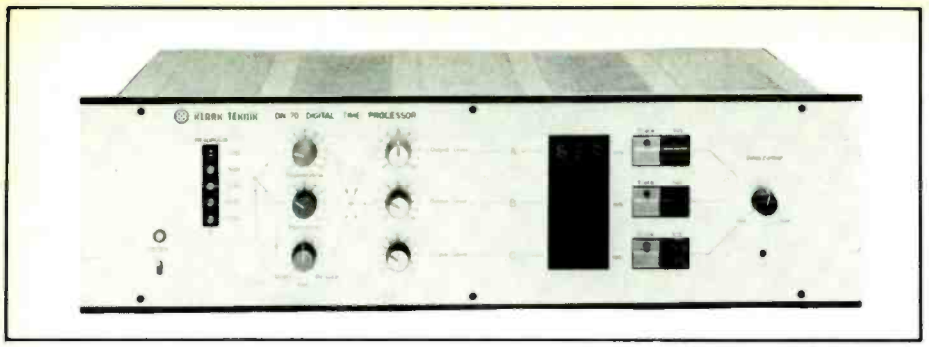
The EM-200 has eight input channels and 120-watt speaker output. The EM-300 has 12 input channels and 200-watt speaker output. For increased flexibility, both the EM-200 and EM-300 have hi and lo impedance monitor output levels (+4dB into 10K ohms, and 0dB into 600 ohms). Additionally, eight patch points allow you to connect accessories directly to the mixer's power amp for dramatically lower noise levels.

The EM-200 and EM-300 give you the short-cut to reinforcement that won't short-change the quality of your sound. They're convenient to set up, operate and locate...at your Yamaha dealer now.

YAMAHA

P.O. Box 6600, Buena Park, CA 90622

CIRCLE 99 ON READER SERVICE CARD



prevent tampering with the delay settings for applications where the unit is permanently or semi-permanently installed. The fourth output channel is where the DN70 really shows its versatility; the fourth output is a mixed channel derived from the three delay channels, and features a regeneration control and a direct/delayed panpot which can be used in conjunction with the delay time and output level controls of the individual delays to produce a wide range of time-based effects.

CIRCLE 29 ON READER SERVICE CARD

Anyone who has dropped a prized guitar on its neck when the strap came loose from the peg on the instrument will appreciate the new, double-lock guitar strap from Metro Enterprises. This new strap design is made to operate with the instrument's normal strap peg; it is made to be put on and taken off easily when needed, but to lock on itself with its uniquely designed "loop lock" to prevent unexpected separations of strap and guitar. The strap is made of woven cotton with a cushioned back.

CIRCLE 30 ON READER SERVICE CARD

A new, compact analog delay line is the latest addition to the product line of DOD Electronics. The Analog Delay 680 has a maximum delay time of 330 milliseconds, minimum delay time of 20 milliseconds and a dynamic range of 80 dB. The unit is designed for use in a musical instrument amplification chain, but features a normal/P.A. switch which changes the sensitivity of the unit to give 10 dB more headroom when driven from a line-level source in a P.A. application. Controls on the unit include delay time, repeat, local mix (which varies the proportion of delayed to straight signal when the effect footswitch is engaged) and remote mix (which performs the same function except that it is not footswitch controlled).

CIRCLE 31 ON READER SERVICE CARD

New from Ibanez is the AD-150, a low-noise analog delay line that's designed to be within the budget of the average musician. The AD-150 has a continuously-variable delay of from 25 to 400 milliseconds; the shorter delay times allow a range of doubling effects which are difficult if not impossible with tape or disc type echo devices.

Among the controls on the AD-150 is an input level switch with −20, −35 and −50 dB positions to match the unit's sensitivity to almost any signal source from a microphone to an instrument to the output of a mixing console; an LED overload indicator aids in setting the switch and input level control for optimum signal-to-noise performance. Other controls on the unit include delay time, repeat, delay level and output volume. In addition to the normal output which carries a mix of straight and delayed signals (controlled by the delay level knob) the unit has a delay-only output for more convenient use in P.A. and recording applications. The effect may be switched in and out with a front panel switch or with an external footswitch plugged in to the jack provided.

CIRCLE 32 ON READER SERVICE CARD

An intriguing new device has been announced by A/DA Electronics. The device is known as the A/DA Humbug and it is a very special noise filter/line driver which uses phaselocked loop and analog delay techniques to eliminate power line-related hum and noise from audio amplification systems for either musical instrument or sound reinforcement applications. The device is said to analyze and lock onto the AC power line frequency, whether it is American 60 Hz AC or European 50 Hz power. The unit removes the noise caused by the power line's fundamental frequency and in addition significantly reduces the noise picked up from light dimmer panels, electric motors and fluorescent lights, all of which are harmonically related to the AC line frequency. The Humbug is normally connected in an audio amplification chain at a point somewhat upstream (before) the power amplifier. This allows it to reduce or eliminate the noise picked up by the signal in its journey through the various devices being used as signal processors or amplifiers. For musical instrument applications, the Humbug can be hooked up immediately after the instrument, or after any signal processors to buffer the instrument's output and eliminate hum pickup and treble loss which are the common consequences of using long cables between an instrument and its amplifier.

CIRCLE 33 ON READER SERVICE CARD

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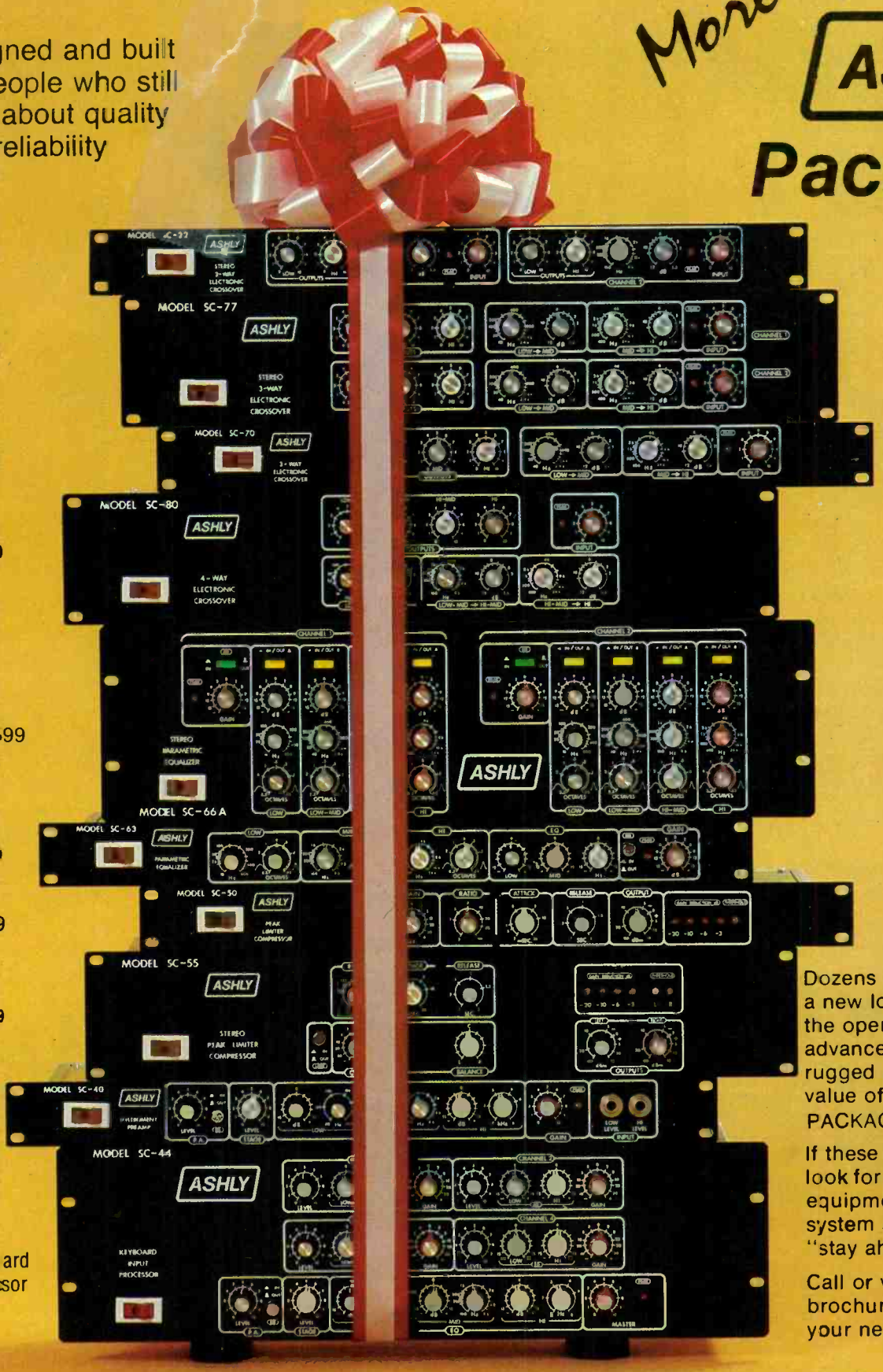

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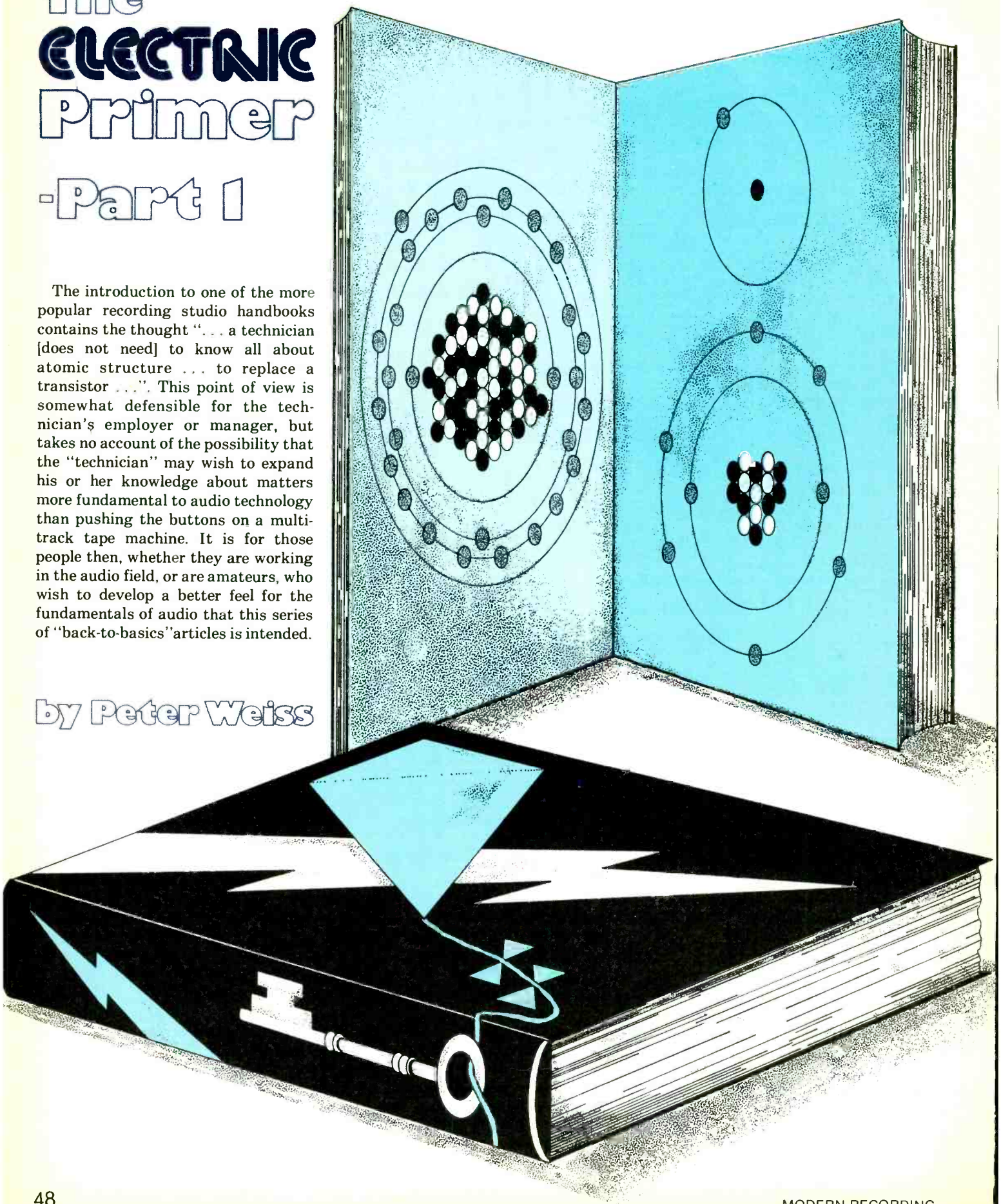
The ELECTRIC Primer -Part 1

The introduction to one of the more popular recording studio handbooks contains the thought "... a technician [does not need] to know all about atomic structure ... to replace a transistor ...". This point of view is somewhat defensible for the technician's employer or manager, but takes no account of the possibility that the "technician" may wish to expand his or her knowledge about matters more fundamental to audio technology than pushing the buttons on a multitrack tape machine. It is for those people then, whether they are working in the audio field, or are amateurs, who wish to develop a better feel for the fundamentals of audio that this series of "back-to-basics" articles is intended.

by Peter Weiss



What is meant by "back-to-basics"? Well, since we're not hawking soap or skincare products, the basics this series will be concerned with are those fundamental areas of knowledge that support all of audio technology: electricity, magnetism, electronics and acoustics, naturally.

Of course, even a series of articles cannot adequately cover every point of every one of the topics to be discussed. Therefore, a book list will accompany each article, with suggested additional reading that will help the interested reader to get a really detailed and well-supported discussion of the topics.

Atomic Structure

The phrase "atomic structure," when presented in any sort of instructional context, is usually enough to drive people away to seek either less frightening or more interesting ways to spend their time. Of course, there may be many ways to spend one's time that are more interesting than the contemplation of the structure of atoms. Boiling water, watching traffic and sculpting with chalk dust are but a few. However, our handbook preface notwithstanding, for our purposes a basic understanding of atomic structure *is* necessary. If for no other reason than to make it easier to define and explain terms that will come up during the discussions about electricity, magnetism and electronics.

So, since it is understood that the construction of nuclear weapons is *not* our goal, our encounter with atomic structure can be brief and uncomplicated.

All material substances can be classified as being either elements, compounds or mixtures. We will be concerned mostly with elements at first, but the other two classifications are important for later discussions. Elements are "elementary" in that they cannot be broken down or transformed into other substances by ordinary means. Examples of elements are gold, oxygen, copper and uranium. Compounds are composed of two or more elements that are chemically bonded together in such a way as to require some sort of energy to un-bond them. Compounds do not necessarily retain any of the characteristics of their component elements. For example, table salt, or sodium chloride (NaCl), is a compound of two elements: sodium (Na) and chlorine (Cl). Sodium is a soft metal that explodes on contact with water, and chlorine is a greenish poisonous gas. Think about that the next time you look at the rim of a Margarita glass. Fortunately (for this writer, at least), bringing salt in contact with lime juice or tequila is not drastic enough to cause the sodium and chlorine to separate. Extensive research supports this conclusion.

Mixtures are substances composed of elements and/or compounds that are just physically mixed together and not chemically bonded. Mud is a mixture.

Another general statement that can be made about matter (material substances) is that all matter is composed of extremely small particles called atoms. How small? One intake of breath contains more oxygen atoms than there are stars in this plus several other neighboring galaxies. The number is something like six followed by twenty-three zeroes. Although nobody has ever actually *seen* an atom, the world seems to behave as if it were made up of atoms, so we will consider it as such. We will be in good company.

Elements consist of only one kind of atom, while compounds are made up of combinations of atoms called molecules. A molecule is the smallest particle of a compound that still behaves like the compound, while an atom is the smallest recognizable particle of an element. Atoms themselves are made up of parts, but these parts are the same no matter what kind of atom they come from.

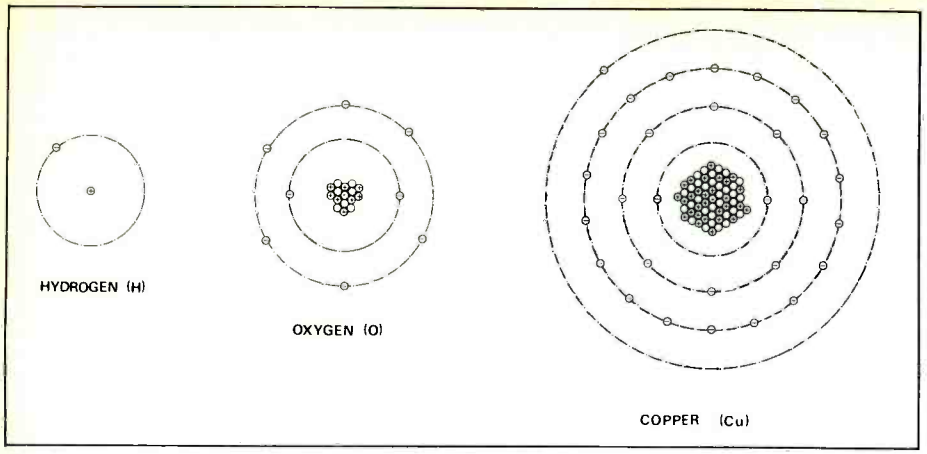
In order to get an idea of how atoms "work," see Fig. 1, which shows schematic representations of atoms of three different elements: hydrogen (H), oxygen (O) and copper (Cu). The central portion of each atom is called the nucleus (plural: nuclei, *noo-klee-eye*) and consists of subatomic particles called protons, represented by circles marked with plus signs. All nuclei other than those of ordinary hydrogen atoms also contain particles called neutrons. These neutrons are represented by empty circles. The circles marked with minus signs represent "orbiting" electrons. Electrons occur in shells around the nucleus, and these shells are represented by the large dashed circles on which the electrons are drawn. There are rules governing how the electrons are arranged in these shells, but a detailed look at that topic is not necessary here.

The only shell of real interest for a study of electricity is the outermost electron shell of any particular kind of atom. To understand why this is so, some additional information regarding electrons and protons is necessary.

All electrons possess a quality or characteristic called "negative electrical charge," while all protons possess an opposite characteristic called "positive electrical charge." The *amount* of charge is the same on all electrons and all protons, the only difference being the sign (i.e., negative for electrons, positive for protons). The terms "negative" and "positive" were assigned arbitrarily (by Benjamin Franklin, yet) to differentiate between the two types of charge. What is important for us to consider is that any two particles that carry the *same* charge will *repel* each other, while two *oppositely* charged particles will *attract* each other. Neutral particles (like neutrons) do not interact electrically at all. The interaction between charges and charged particles is the basis for all electrical and electronic phenomena. Specifically, electricity involves the movement of a *negative* charge, of which the charge on the electron is the smallest possible unit. The electron is sort of an electrical charge "carrier," and therefore electricity can be considered a movement of electrons. Generally the electrons involved originated in the outer shells of atoms.

But what about the like-charged, positive protons in the nucleus? Why don't they repel each other? The fact is, they try, but when protons get squeezed together tightly (with neutrons) to form a nucleus, the rules change and a "strong nuclear force" arises and overcomes the electrical repulsion. The release of this "nuclear energy" from the nuclei of uranium and plutonium atoms is the process (called nuclear fission) that has, over the years, given us radioactive waste, Three-Mile Island and an infamous reworking of the Japanese landscape.

As mentioned before, electricity involves the movement of electrons. Electrons, under certain circumstances, can be separated from their parent atoms. The ease with which this can happen depends, for atoms of one kind, on the number and arrangement of electrons in the outer shell. The outer shells of the atoms of some metals have one electron that is not bound very tightly and can be moved



Illustrations by Peter Weiss

Figure 1

away easily. In fact, such outer shell electrons can detach themselves from atoms in a metal and wander around freely, latching on to other metal atoms having a space available vacated by an errant electron. This high availability of free electrons makes it easy to cause electrons to move through most metals. A material with this property is called a *conductor,* since the presence of free electrons and the ease with which outer-shell electrons can be detached and reattached can cause a negative charge to be "conducted" easily through the material. Silver is the best conductor of electricity, with copper, gold and aluminum following in order. Other metals are fairly good conductors of electricity, but the ones just mentioned are the top four.

We're almost out of the atomic structure quagmire, but we have to plunge back in one more time. Examine the drawings in Fig. 1 and count the number of plus and minus signs (protons and electrons) in each atom. There should be, if the drawings are correct, equal numbers of plus and minus signs for each atom. Bearing in mind that the electrical charges on the electron and proton are equal though opposite, we can assume that the atom as a whole is electrically neutral. That is, the positive and negative charges cancel each other out, so that outside the atom no overall charge of one kind or another is observed. An atom with a missing electron will be positively charged because of the missing negatively charged electron.

Now if a copper atom, with all of its electrons, is electrically neutral, then a length of copper wire containing billions of trillions of copper atoms can be expected to be electrically neutral. This is the case, despite the game of musical chairs (or musical shells) being played by the free electrons. A mass of metal is electrically neutral despite free electron "drift" because the motions of the free electrons are all in random directions. It is when many electrons *move in the same direction* that electricity becomes an electric current. In fact, our definition of electric current will be: a directed flow of electrons. How much current is present is determined by how much charge flows past a given point during a given interval of time.

How are electrons caused to flow all in one direction? Since electrons are negatively charged they are repelled by other negative charges and attracted to positive charges. So, if we want to cause electrons to flow through the length of a piece of copper wire, all we need to do is to bring a positive charge near one end of the wire and a negative charge near the other end, right? Let's examine what would happen if this were done. Fig. 2 shows the arrangement. Notice that the end of the copper wire near the external positive charge is negatively charged due to the crowding of electrons attracted to the external positive charge. The other end, near the external negative charge, is positively charged, due to the *absence* of electrons that have moved away. If nothing else changes, the situation will remain as shown. Strictly speaking, what is depicted is not a flow of electric current since all the charge eventually comes to rest. In order to have a flow of electric current through a length of wire it is necessary not only to provide the proper charge polarities at both ends, but also to provide a source of electrons and a place for electrons to go once they've made the trip through the wire. Also, both the source of electrons and the final resting place for them must be physically connected to the wire by conductive means, since electrons do not normally travel through air.

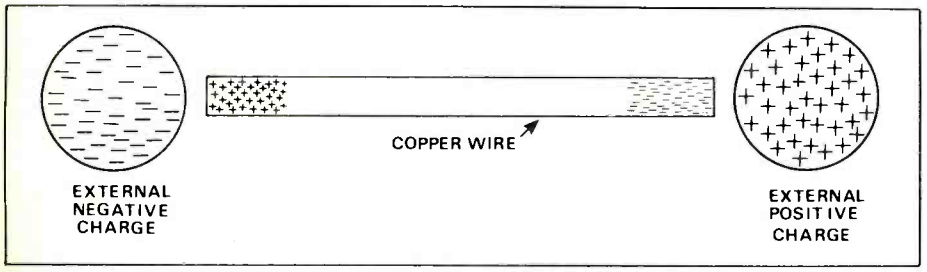


Figure 2

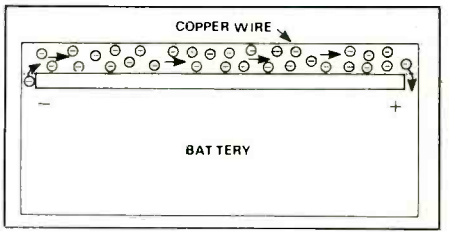


Figure 3

A familiar, simple device that provides, by chemical means, both negative and positive polarities (creating what is called a "potential difference" or "voltage" between the oppositely charged terminals), a source of electrons and a place for electrons to go is the battery. When a battery is connected to a piece of wire as shown in Fig. 3, the potential difference or voltage between the positive terminal and the negative terminal caused electrons to flow through the wire to the positive terminal, and since there is a source of electrons at the negative terminal, the flow will continue. This directed flow of electrons is an electric current. When a current flows in only one direction it is called a *direct current* or D.C.

Backtracking a bit, in Fig. 3, the electrons move from the source (the negative terminal of the battery) through the wire to the positive terminal and then into the battery. If we had no idea of what was actually going on inside the battery, we might

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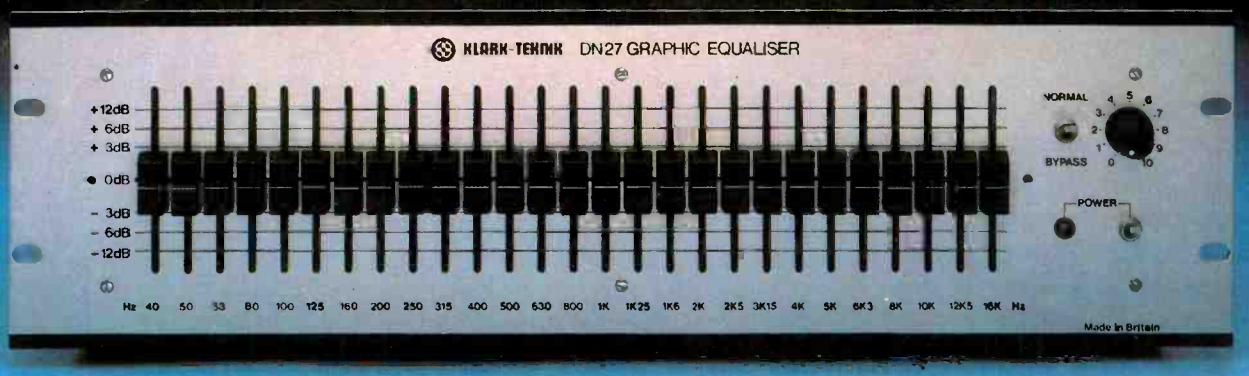

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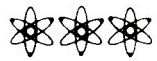
assume that electrons were just making round trips along the entire path just described. Although this is not the case, we can proceed as if it were and keep in mind that for a current to flow, there must be a round-trip path for electrons to follow. Such a path is called a circuit or complete circuit. If a complete circuit does not exist, no current will flow.



So far we've encountered and defined two very important terms in electricity: current and voltage, or potential difference. Another important electrical quantity is one that relates voltage and current. Since a voltage is required to push a current through a conductor, determining the amount of voltage required to produce a given amount of current would be a good indication of how much "resistance" a conductor offered to the flow of current. This resistance can be expressed very neatly as the ratio of a voltage to the current produced by that voltage. This can be written as:

$$\text{Resistance} = \text{Voltage:Current}$$

or

$$\text{Resistance} = \text{Voltage} \div \text{Current}$$

or

$$\text{Resistance} = \frac{\text{Voltage}}{\text{Current}}$$

Voltage, current and resistance are generally expressed in units of volts, amperes and ohms, respectively. Using these units and the relationships just shown, we can say that a voltage of one volt will cause a current of one ampere to flow through a conductor having a resistance of one ohm. Using accepted symbols for voltage, current and resistance we can present the relationship just described as a formula:

$$\text{Resistance} = R = \frac{\text{Voltage}}{\text{Current}} = \frac{E}{I}$$

or

$$R = \frac{E}{I}$$

This formula, and the relationship between voltage, current and resistance it expresses, comprise Ohm's Law, named for Georg Ohm (1787-1854) who discovered the facts experimentally. Ohm's Law will be applied

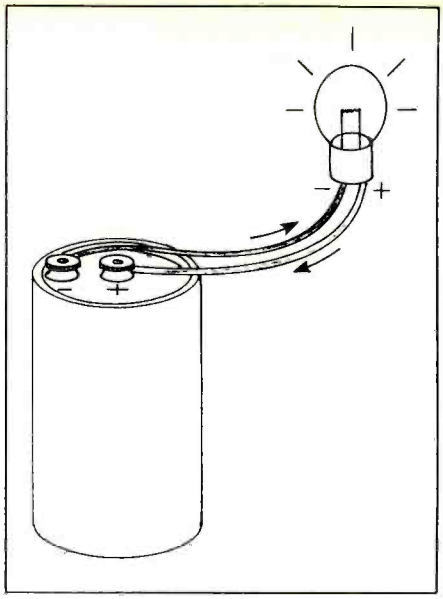


Figure 4

very often in future discussions, so it will be helpful to look at the formula as it is set up to express each of the quantities:

$$\text{For Resistance:} \quad R = \frac{E}{I}$$

$$\text{For Voltage:} \quad E = R \times I$$

$$\text{For Current:} \quad I = \frac{E}{R}$$

In order to prepare for next month's exploration of direct current circuits and applications of Ohm's Law, see Fig. 4, which is a pictorial representation of a circuit consisting of a 10 volt battery and a light bulb. The wire inside the light bulb has a resistance of 10 ohms. This circuit is redrawn schematically in Fig. 5. According to Ohm's Law,

$$I = \frac{E}{R}$$

$$I = \frac{10 \text{ volts}}{10 \text{ ohms}}$$

$$I = 1 \text{ ampere}$$

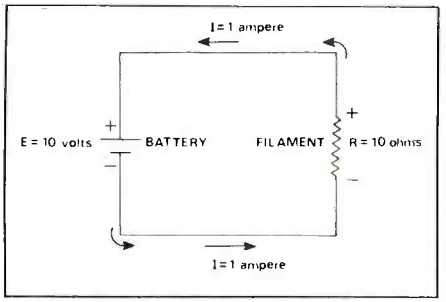


Figure 5

This current flows through the entire circuit and is the same everywhere.

Following the direction of electron flow around the circuit indicated by the arrows, and starting at the positive battery terminal, we can imagine what happens to an individual electron on a trip around the circuit. First, going in the direction indicated, the electron travels "through" the battery, experiencing a potential difference of negative 10 volts. Since the battery is connected directly to the bulb, the polarity of either side of the bulb matches the polarity of the battery terminal to which it is connected. The potential difference between the ends of the bulb filament is also identical to the battery voltage for the same reason. Thus, the electron, in going through the filament from the negative end to the positive end experiences a potential difference of positive 10 volts.

The total of negative 10 volts and positive 10 volts is zero volts, so on its return to the positive battery terminal the electron has experienced a *total* potential difference of zero. This concept can be expanded to a general rule, which states that the sum of the potential differences around a closed circuit is zero. Whether a potential difference is positive or negative depends on which polarity is encountered first. For an electron, going from a place of negative polarity to one of positive polarity is considered as crossing a positive potential difference.

Going the other way, from positive to negative, is considered as crossing a negative potential difference.

This last concept, that of an electron crossing potential differences on its trip around a circuit, coupled with Ohm's Law, will serve as the tools for next month's investigation of more complex direct current circuits.

The following books served as source material for this article, and are suggested reading for those interested in obtaining additional information.

Bibliography

Bueche, Frederick J. *Introduction to Physics.* 2nd ed. New York: McGraw-Hill, 1975.

Jacobowitz, Henry. *Electricity Made Simple.* New York: Doubleday, 1959.

Shrader, Robert L. *Electrical Fundamentals for Technicians.* 2nd ed. New York: McGraw-Hill, 1977.

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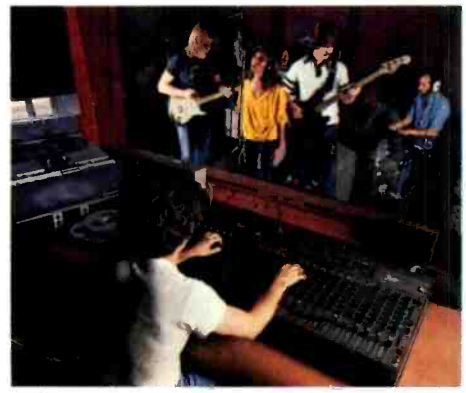

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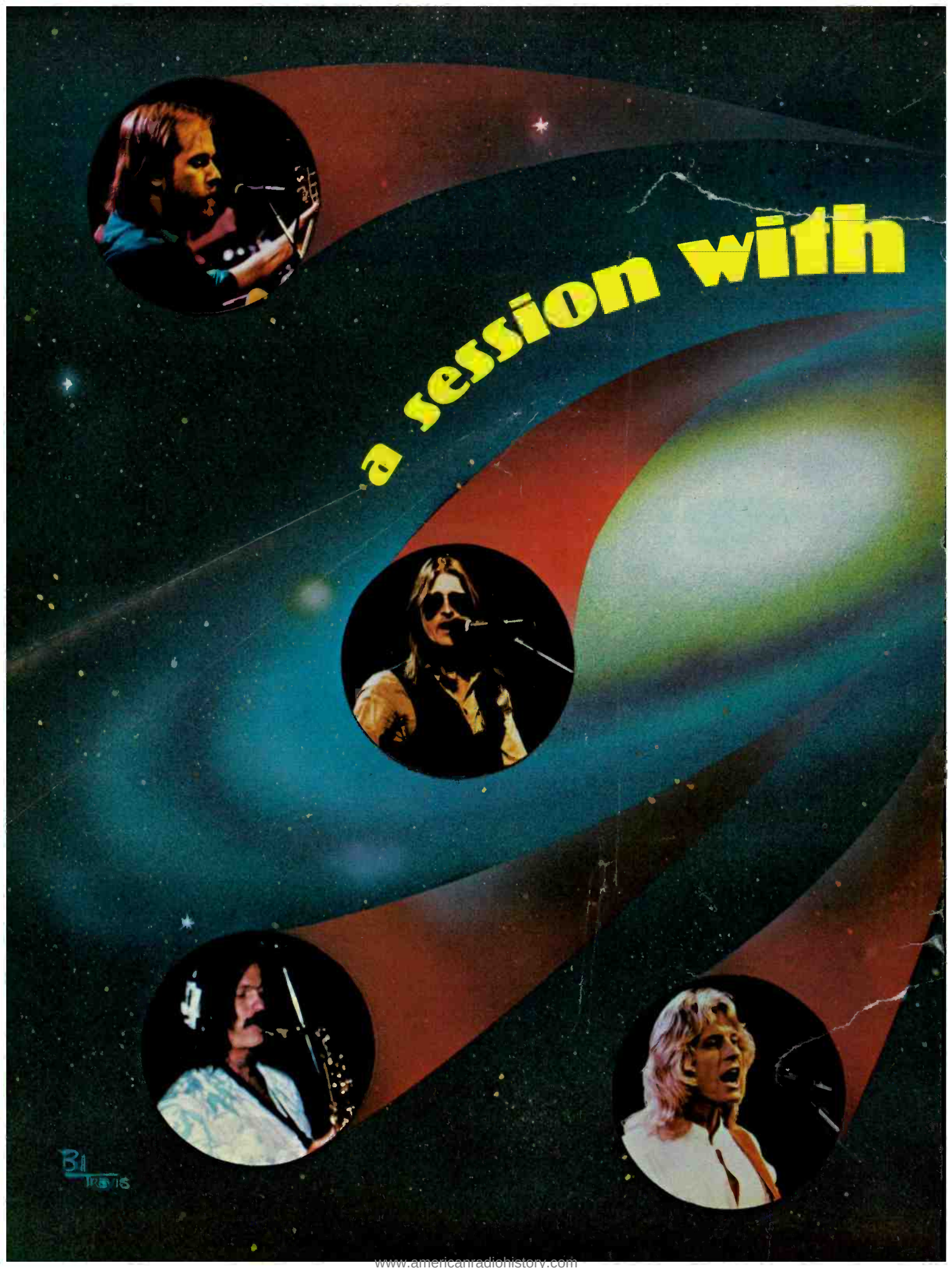


FIREFALL

by RUSSELL SHAW

In the control room of Miami's Criteria Studios, Firefall guitarist Joe Bartley and co-producer Ronnie Albert simultaneously struck cigarette lighters. Fear not, for musicians and guests were not about to embark on any sort of controlled substance adventure; the flame-givers were struck to illustrate a rhetorical, rather quippy analogy.

All were in attendance to record the new, and fourth Firefall album. From start to finish, a methodical, painstaking process. Those involved were at the moment fine-tuning one song, a moving soft-rocker called "The Love That Got Away." The task was to see a skeletal rough mix grow into a full-blown final mix.

So there we were, stuck in a cloistered facility in the early afternoon of a mid-nineties Miami day, the beach and all its temptations but a short drive over a narrow stub of causeway. Lead singer Rick Roberts was in the process of applying a "pilot," i.e., a test-vocal to the tune, experimenting with different vocal inflections, phrases, etc., when Bartley and Albert, striking their lighters, jointly quipped: "This take oughta be more realistic, Rick. These lighters should capture the Firefall concert effect. You've seen people wave these things for encores, right Rick?"

That question is readily answerable, for hard as it is for a new band to come out of the box smokin' Firefall was a gold record commodity from first inception—an outgrowth of former players for Steven Stills, the Flying Burrito Brothers, and other bands of similar styles. The year 1977 saw their initial platter; bolstered by the inclusion of a readymade, top-ten single, "Just Remember I Love You," the issue, and aggregation, was already well on its way.

Touring opportunities also beckoned. First, opening slots with acts as wide-ranging as the Marshall Tucker Band and Heart. Then headline roles in coliseums, justified by two more gold albums, and other hits, such as last winter's slighty eerie, yet catchy "Strange Way."

Witnessing the waxing of album four (untitled as of press time) one grasps immediate comprehension of the Firefall recipe. Simple, yet cultivated melodies; a series of hummable constructs connected by choruses of deceiving complexity; the sensual, and never indulgent inclusion of woodwind figures into the above framework; the

(L to R) Joc Bartley, percussionist Joe Lala, engineer Don Gehman, Rick Roberts and producer Ron Albert listen to a playback.

multi-part harmonies; the fluid range of lyrical persona, ranging from a non-chauvinistic, haughty approach to romantic difficulties, to a tenderness which is neither wimpy nor affected.

Capturing these vinylizations requires a studio staff attuned to the band on more than just a technical level. Twisting some knobs might grab at some of the rough edges, but a true artistic and personal rapport, based as much on vibes as knowledge, signifies the true cutting edge to an ideal production effort.

Firefall's producers are Howie and Ronnie Albert. They've been at Criteria since the early days, when the great soul singers of the sixties, people like Wilson Pickett, among others, would come down and tear their throats out. Back then, the Alberts were engineers only, but now all you need to do is see all the platinum albums on the walls: Allman Brothers, Bee Gees, Chicago, and others, to realize that although Ronnie and Howie did not work on all these undertakings, that as Criteria staff producers, owners of Fat Albert Productions, and a record company as well, they are truly two of the fastest rising stars in their chosen field.

During a break, and also during sporadic intermissions, *Modern Recording* sat down with Howie Albert to exchange ideas, thoughts and attitudes about Firefall and about the business of producing in general.

MODERN RECORDING: Many musicians prefer to work at night, fewer distractions and so forth. Yet with Firefall, you seem to be on a fairly rigid schedule—11 a.m. through 7 p.m. You obviously have a reason for this.

HOWIE ALBERT: When you work at night you don't get a lot done. This way, when we finish at seven, there's time to go home, clear your head and make judgments while you are still awake. You're not burnt out. Let me tell you something else. We keep a graph on all projects, both day and night, and in no instance did we find a faster pace at night. Economically, day work pays off, budgets and studio time are less.

MR: How did you originally get started here at Criteria?

HA: I was a musician first. I was offered a job here through Tom Dowd and Jerry Wexler, who were working with Wilson Pickett. Ronnie was already here, so for me it was a crash course of learning the board.

MR: What was the first album you produced?

HA: We did not become producers overnight; but rather in steps. Like on the Joe Walsh album, *The Smoker You Drink, The Player You Get*, it can be the case of the producer not being there all of the time, you doing everything but the vocals and the mix, and then the album coming out and you not getting credited the way you should be. Guess that's called getting f- - - ed over royally.

Our first "official" album, though, was a group called Rasputin's Stash about eight or nine years ago.

MR: Who are some of th
that you've worked with up t

HA: Stephen Stills, Blac
kansas], Crosby, Stills
McGuinn, Clark & Hillma
Wright, Eric Clapton, and Firefa

MR: How did you get to produ
these guys [Firefall]?

HA: Tom Dowd was producing their last album (*Elan*). Firefall's manager at the time, Mick Fleetwood, heard some of the tapes and thought they needed more work. There was a feeling that a few of the tunes could have used a little more embellishment, but at that time, Tom had moved on to another project. Meanwhile, Rick Roberts of Firefall, who had been with Steve Stills at about the time of Manassas, and had gotten to know us back then, called us up and asked if we were interested. We were.

MR: What changes did you make?

HA: We did what we thought would make the album more commercial, like the flute and string stuff on "Strange Way," and the overdubbing of drums and bass on "Sweet and Sour." Originally it was done acoustically.

MR: If you were to describe the music of Firefall to someone who had never heard the band, what would you say? How do those traits dictate your approach behind the board?

HA: They have very good melodies, have good hooks and are very commercial. They appeal to women a lot. Plus there's the harmony thing too; the Firefall voices are pleasing to listen to. Firefall's music is in the middle ground between a Crosby, Stills & Nash folk vein and a Fleetwood Mac rock vein.

Basically, what we do is in the area of sound reinforcement, to make it sound modern and fresh, to change as it flows along.

MR: Firefall is based in Boulder, Colorado, and Ronnie and you are based here in Miami. There must come a time, at the commencement of an album project, when you all get together and the songs are introduced to you. What are the dynamics of that both logistically and artistically?

HA: We flew out to Colorado. The guys have a practice hall out there. They did some playing, and we did some listening. There was an abundance of songs: they tend to be extremely prolific writers.

When it comes down to getting the material studio-ready, I don't like to rehearse a band. They shouldn't learn things lick for lick, because if we get a

flash [in the studio] that some other part might work better in this section or that, it costs you more to "unlearn" a song. We're not in for egos, we're in to make a record.

MR: How do you approach working with your engineer?

HA: Don Gehman, engineer for the Firefall album, is actually a producer in his own right. He co-produced an album for a group called Breathless for EMI-America. We consider him part of a threesome in Fat Albert Productions. It is good in that we can give him stuff that, since things are going so good, we can't handle. He's also responsible for the designs of all the monitor systems in here.

MR: There are those former engineers, now producers, that, since their ascension, have lost day-to-day awareness of the latest technical developments in the world of audio. Ever find yourself in such a predicament?

HA: Well, fresh things are happening all the time. I used to be more technical minded, but I haven't gone to an AES convention for the past two years. I haven't lost touch though, being involved in Criteria I'm aware of all the latest gadgets, and since manufacturers, like MCI, for instance, like to build with the user in mind, I wind up rapping to them a lot.

MR: I noticed that you and the engineer keep a log book on each project.

HA: Yes, let me get it for you.

Howie returned two or three minutes later with the said book, more like an encyclopedia, including every tune, track, time, tape, position, overdub, vocal and instrumental during the whole proceeding, from start to finish. An example, chosen randomly:

"The Love That Got Away"

Trk. (listed 1-24)	Inst.	Mic	Artist	Date	Time
9	EGT (elec. guitar)	86	Larry Burnett	6/6	11:45 a.m.-12:20 p.m.

Quickly, Howie brought the session bible back to its cubbyhole, and our chat continued as engineer Don Gehman dropped by to listen and join in.

MR: Ever been turned on to working with "live" sound?

HA: I've done some "live" recordings, but the studio is where it's at. There you can refine to a point of near perfection, but in a club or concert hall, with all those acoustical bugs, and the impreciseness, it just is not the same.

Producers (L to R) Ron and Howie Albert.

About this time Howie got called back into the control room to do some mixing, which left engineer Don Gehman and this scribe in a Criteria second floor conference room, to chat about nuts and bolts stuff.

MR: How did you become involved in studio engineering?

DG: I have a technical education background, having had electronics training at Penn State. I've also played the viola for ten years, so I have a musical perspective also.

I worked for Clair Brothers Audio for ten years. I constructed sound equipment used on "live" shows by Yes, Chicago, Crosby, Stills, Nash, & Young and Steven Stills. I also worked with Steve Stills on the road. Steve knew Ronnie and Howie from other projects, and so I was told that they needed an engineer here. I've been with Criteria for five years now.

MR: What are some of the albums you've worked on?

DG: Firefall, Henry Paul Band, McGuinn, Clark & Hillman, John Cooper, Pure Prairie League, and Chicago's last album, *Hot Streets*.

MR: Let's get to some technical material, specifically, specs for this new Firefall album. A good place to start would be mics, What do you use on Mike Clarke's drums?

DG: AKG D-12 or Sony 55 on the kick drum. I'm conscious of making each sound a part, and I like the way they sound without equalizers. I'm not equalizer oriented. Continuing, AKG 414 on snare. I'm a big fan of a lot of snare. I also work with Beyer M-88s on toms; they're a dynamic mic, warm, with a lot of punch and a nice back end. Also, AKG 452 on cymbals, and Neumann KM-85 on high hat—on the side. It gives nice leakage in the area, so you don't need another mic.

MR: We also noticed the addition of percussionist Joe Lala on a couple of tunes, obviously to bring out the underlying rhythmic subtlety of Firefall's music. How do you record Joe?

DG: I generally mike Joe with one Shure SM-81 on congas, and a Neumann U-47 on timbales.

MR: What is your view on the booth-ing of drummers?

DG: I don't like to do it. It can bring on a psychological mess . . . not only that, but I like the ambience of room mics. I like drums being part of the complete room ambience.

MR: Here at Criteria, there is a good deal of funk [R&B] recording done. Drums play a vital role in funk. For an engineer such as yourself, what technical adjustments must be made between that genre and rock?

DG: More room mics should be used in rock. You need more ambience. With funk, it is padding and muting of the instrument so there's little hangover.

MR: What is your optimum way of

recording bassist Mark Andes?

DG: We don't use any bass mic. We don't want to mix that up with anything else, because then you have a problem of phase cancellation in the mix. He [Andes] has a Fender Precision bass, and we work with a dbx 155 limiter. With electric bass, choice of mic is frankly less important than choice of [amplifier] head and strings.

MR: This band has, of course, two primary electric guitar players, Joc Bartley and Larry Barnett. How do you work them?

DG: Joc uses a Les Paul most of the time, and a Telecaster once in a while. Larry's got a different guitar, an Alembic, but I mic them the same, with a Neumann KM86. We use power alternators. They allow you to run amps without a great deal of distortion. You can run them fairly loud, but they remain in balance with the room. This technique allows you to avoid a great deal of leakage problems.

MR: Rick Robert's voice is obviously a vital part of the Firefall sound. How do you both analyze and harness it?

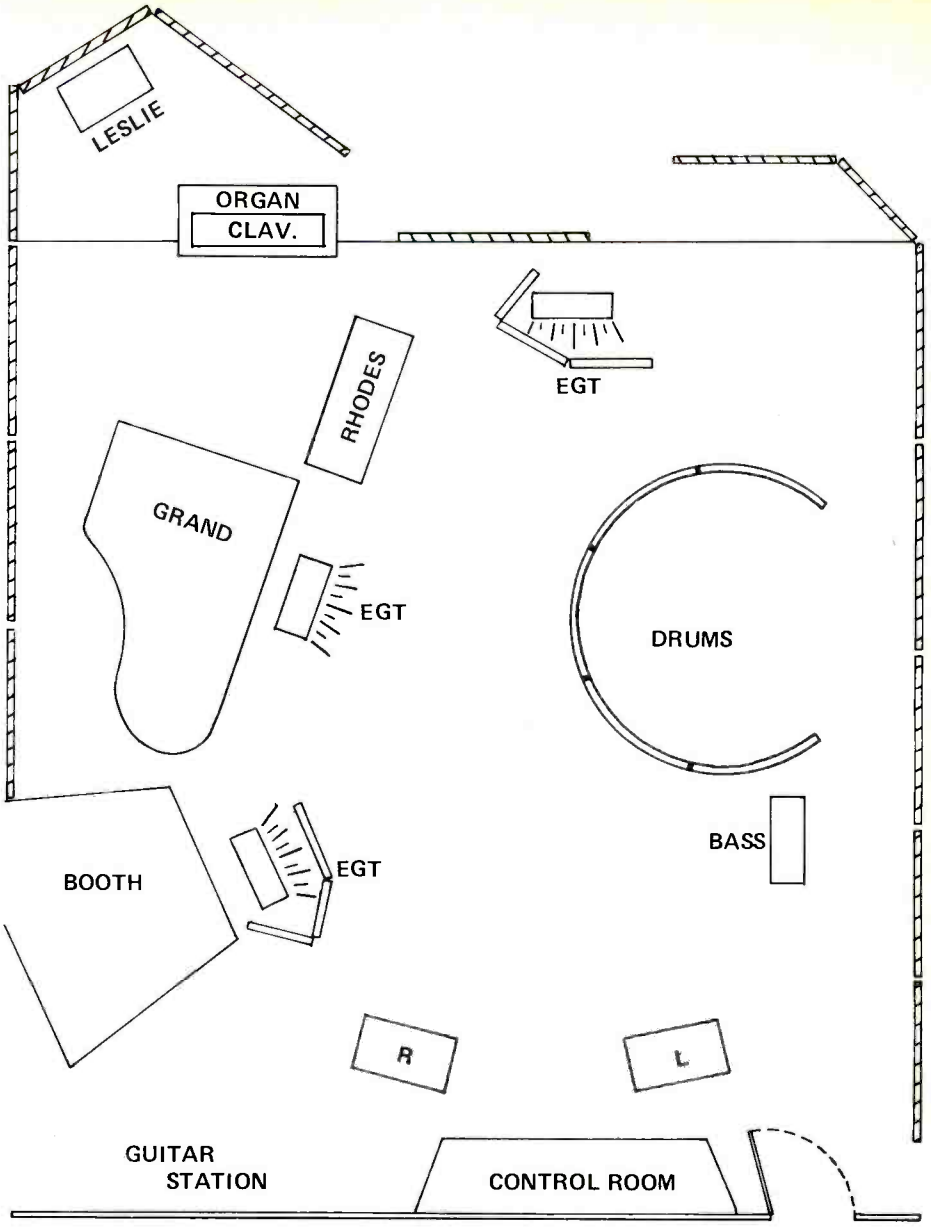
DG: Well, he's not easy to record. He's got a lot of power and good dynamics. He's a tenor, but has got a lot of range in falsetto. Sometimes, he'll hit you with a lot of power, other times with feeling, which he brings out from the chest. He's got a controlled, trained voice. The best mics for him are the Neumann 87 or the AKG 414.

MR: David Muse's flute and sax playing are a Firefall trademark; airy creative rides are part of the overall appeal. How do you capture it on tape?

DG: The AKG 414 or Neumann 87 is best for flute. For sax, the Neumann 47, 86, or 87, depending on whether it's a single sax, a component of a horn part or an overdub.

MR: Can't help commenting that these monitors are comparatively small. Given your resources, why don't you go for the biggest?

DG: There's a good reason for that. This material will eventually end up on turntables, and most people, face it, have those two or three hundred dollar systems. We've got to think in their terms somewhat, so we've got David 50s [The David Series is in the Visonik of America line. The two-way D-50 model measures 6¾" high, 4⅛" wide, and 4¼" deep.] in our monitoring system, working with our MCI 536 32-channel board, dbx 160s and Lexicon prime time pre-echo delay.



MR: How is the room set up?

DG: This room has a 4½-second echo chamber. We can also get short DDL delays in the 30 millisecond range; we have a lot of digital echo in the house. We have [an] EMT 250 [digital reverb unit] and [a] Lexicon [unit], but I like "live" chambers and plates.

We have an Eventide digital delay, and Harmonizer, which is used a lot on vocals and guitar. We also employ a UREI 1176 vocal limiter.

MR: Tape?

DG: We now rely on 3M 250. We previously were using Ampex 456.

MR: Your approach to the intricacies of mastering?

DG: We've been sending our masters out to two or three places, but we've been getting some of the best results here. A Danish company has designed a master cutting system where a Scully lathe accommodates its head. It seems superior to Neumann, gives more frequency response, and makes the record sound more like a tape.

* * *

Record, tape, or whatever, it seemed incongruous that while bathers baked in the June Miami sun, six musicians and technical whizzes were collaborating on an album slated for fall release, and that in much of the country snowdrifts would be dodged by autos en route to shopping centers to buy this surefire hit album in time for Santa's arrival. Yet in the time-warp world of recording, where tomorrow is today, and vice versa, this is just standard operating procedure.

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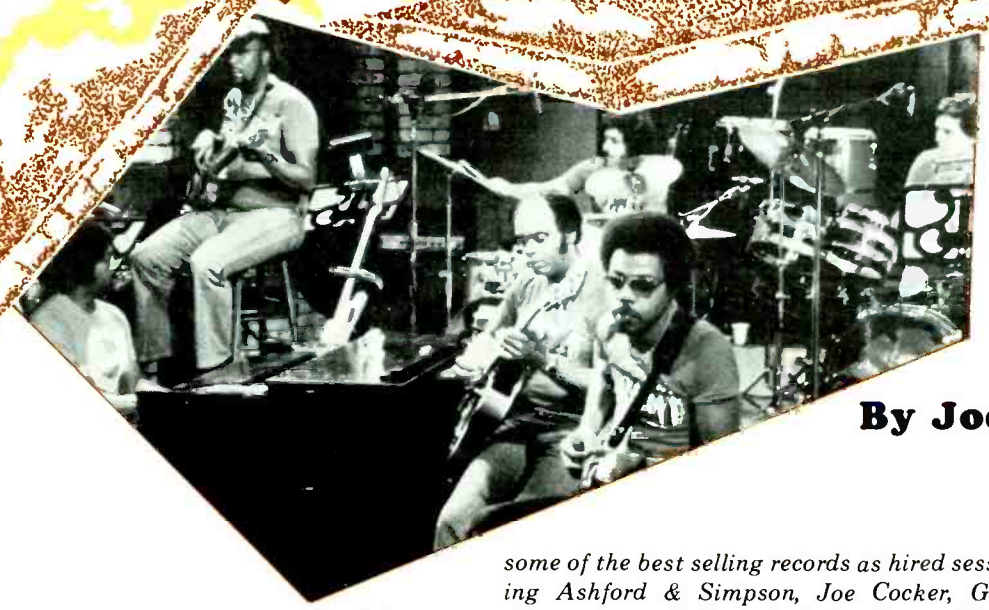

By Joel Siegel

The early sixties was a particularly ripe period for Rhythm & Blues music in America. Labels such as Atlantic, Motown, and Stax/Volt were turning out great records in the same vast quantities many labels have been turning out disco records (no value judgment) today.

Each "soul factory," be it Atlantic in New York or Motown in Detroit, had its own house band, or stable of musicians. One group of players could be heard on, for instance, all the records by Aretha Franklin, Wilson Pickett, Donny Hathaway and Brook Benton. The tunes and arrangements would vary from artist to artist, but the soulful sounds of the Atlantic house band (a.k.a. King Curtis' band) would be heard on all the records by those artists.

The members of Stuff are rooted in the house band tradition. Stuff members Eric Gale (guitar), Cornell Dupree (guitar), Gordon Edwards (bass), and Richard Tee (piano) staked their claim in the music business as session players on R&B dates in the sixties. Richard Tee worked extensively for Motown, as did Eric Gale. Cornell Dupree, whose father Champion Jack Dupree was a noted R&B bandleader [and, incidentally, a fine blues pianist and songwriter] appeared on many classic Atlantic recordings. Gordon Edwards has been a mainstay of the New York City studio scene.

Stuff is state-of-survival R&B. Its brand of music certainly does not dominate the charts, although the players appear on some of the best selling records as hired session men, including Ashford & Simpson, Joe Cocker, George Harrison, Quincy Jones, Billy Joel, Carly Simon, James Taylor, Paul Simon, Phoebe Snow, Chuck Mangione and Bob James' dates. When they are on their own, the members of Stuff, which also include Chris Parker (drums) and Steve Gadd (drums), go back to the blues- and gospel-flavored music that is their heritage. It is a music of struggle and camaraderie, of strength. It is a laid-back form that connotes family, and at the same time promotes individual stretching out. This music is a sizable branch on the tree of great Black music that is America's alone.

Though they had played together in various combinations, the members of Stuff first became known as a working unit while backing Joe Cocker on one of his comeback tours a few years ago. They have since gone on to record three records for Warner Bros. The latest is Stuff It! *(BSK 3262).*

This writer was fortunate to have caught one of the rare appearances by Stuff, at Long Island's My Father's Place. *(The lucrative studio life of New York City makes it unprofitable for these gentlemen to tour regularly.) Between sets, I was able to corral Richard Tee, Chris Parker, Cornell Dupree, and ever so briefly, Eric Gale for an interview. I would throw out a question here and there, but basically this is running conversation among the players. Some of the extemporaneous comments make this an unusual, and sometimes enlightening, interview.*

Modern Recording: When did you become studio musicians?

Cornell Dupree: In 1968, after I returned from Texas. I was studying with [bassist] Chuck Rainey. He had gotten into recording and he introduced me to certain people. The same with Eric, he was into it before me.

Richard Tee: Eric was into it before me. I started recording at Motown in 1963. I graduated school in 1961, that's when I met Eric and Purdie.

CD: Purdie also turned me on to a lot of sessions. And, when Eric left town for a while—he went to Jamaica for about a year or so—I worked with all of his current clients.

I was working with King Curtis at Atlantic and I was working with all the people around there . . . and I did Wilson Pickett, Aretha, Roberta (Flack), Donny (Hathaway), Brook Benton, and on and on.

MR: Let me ask you what some of those Aretha Franklin sessions were like. They were classic.

CD: Yeah! They were. They were fun, nice music, and good people on the sessions: myself, Purdie, Chuck Rainey. The songs always influenced the performance a lot.

RT: We'd play a song and get a groove, and she'd say, "No, don't play it that way, play it *this* way."

Aretha and [producer] Jerry [Wexler] could put things together. He was inside behind the board and could hear the whole thing better than we could. He'd say, "Let's try this or this," and it would really work.

MR: Jerry Wexler gets credit on some of those records for arranging as well as producing. As a listener, that always seemed like an overstatement, as the interaction among the musicians seemed to be the arrangement.

CD: Correct. Everyone would hear the song, and then attack it.

MR: How about the Motown sessions. Was that a whole different group of people?

RT: No, well . . . I didn't do that many in Detroit. I did most of my Motown stuff here in New York. When they closed their offices here and went back to Detroit, I stayed here and started freelancing. I was born and raised here in New York.

MR: What are some studios you guys like to play in these days?

CD: Electric Lady's nice. I like Atlantic. The Record Plant.

Chris Parker (*who entered the room a minute before*): Studio preferences differ radically according to your instrument. A place that makes a guitar or piano sound great may make drums sound terrible. Some places have that long shag carpet and the drums never sound like drums. I'm talking about when I'm sitting right there and playing them.

CD: I like the small studios where you can hear everyone without the tape and earphones.

RT: I like a studio that just sounds "good."

CD: A lot of times it's not the studio, it's the engineer that gets the sound.

RT: I dig A&R [New York] because of [engineer/producer] Phil Ramone. Phil Ramone makes everybody sound just right.

CP: There are other great engineers [at A&R]. Everybody who seems to work there . . . Elliot Scheiner. It's a good room. Both rooms, The way they have it set up is like a stage. On the top level are the drums and bass and guitar. The piano and keyboards, percussion and stuff are on the next level. It makes it really easy because you have direct eye with the engineers and the people you're playing with. It's real simple, nothing tricky about it.

MR: Chris, do you use different drums in different studios?

CP: Well, the studios that I like either have their own set of drums, that's a good sounding set, or if they don't, I have my own sent in, which are Yamaha. I know what they'll put out and how they'll react. Even in the studios with all that carpet, they will still be resonant enough. In those [carpeted] places they have drums with only one head on them and lots of tape, which makes it great for the engineer, I guess, but it isn't a drum anymore. With one skin, the sound is much thinner and clearer, but it's not fun to play and it doesn't sound good. I'll use what's there if it's good.

MR: I've heard that the Power Station is a real good place to play.

CD: That place has a good sound.

RT: A "live" sound.

CP: If they had set up the big room at the Power Station with a stage like the one I was talking about, it would be perfect. You could look over and see the piano player.

MR: What studios are or tend to be "live" oriented?

RT: A&R's "live."

CP: Penny Lane's pretty good.

CD: Speaking of Penny Lane, where is that located?

RT: Penny Lane's at the MGM Building, 1350 Sixth Avenue.

CD: You got a 2 o'clock there on Monday?

CP: Yeah, you going to be there?

CD: Yeah.

CP: Good!

MR: Richard, how many different keyboards do you use?

RT: I try to bring it down to just three: acoustic, Fender Rhodes, and if I have to, organ. For me, those three are enough for me to do whatever I have to do, or say whatever I have to say about whatever I'm playing.

MR: What kind of organ?

RT: Hammond B-3 or C-3. They're both the same thing, only the C-3 has a lot more wood and weighs about 500 pounds more. Like in the old Broadway [recording studio], they had a C-3. Most studios use the B-3 because it has wheels and you can move it.

MR: Cornell, what sort of setups do you use?

CD: I just bring my guitar. I always request a Fender Twin Reverb amp, when there's an option. A lot of times they don't have anything that you're familiar with, and you have to deal with that or go direct, which doesn't make much of a difference because the sound comes from the guitar.

RT: If you use a phase or something like that you have to use an amp.

CD: Well you can still go direct.

RT: Oh, you use a direct box, like with a clavinet.

CD: Right. You put the thing in between your instrument and the direct box. Actually, the best thing to do is to record it direct and then phase it or do whatever trick you want to do. If you put the distortion unit in between the instrument and the direct box, sometimes it makes a lot of noise which they can't take out or do anything about.

I use a Fender Telecaster guitar and a Fender Twin with Lansing speakers. I got an additional pickup on the guitar, a DeArmond. With that equipment I usually get the sound that I want. I don't use too many effects. I try to do it as natural as possible.

CP: I can't understand the two-amp set-up that Eric has. I've heard of guys that have stereo guitar . . .

CD: It's just a two-amp set-up. It's not stereo.

MR: I was wondering how all of you like to have your instruments miked.

CD: We don't have very much to do with the miking of it.

RT: We just go ahead and play what it is we want to hear.

CD: Once you get the sound right,

leave it there.

CP: I'll tell you something. I can tell by the way a microphone looks and the way the guy places it whether it will sound good or not. I don't know their names, but I know . . .

CD: The ones that get the good sound, certain shapes.

RT: For your drums, or for anything in general?

CP: Just for drums. There are certain mics that really work good, and certain positions too.

MR: Could you talk about some interesting sessions that you've done?

RT: They've *all* been interesting and different sessions.

CD: Sometimes you might like the music better than at other times, some jazz here, or some funk here, or some waltzes over here.

RT: I had a really challenging date once. The fellow had some 50,000 notes. I said, "Whoo Boy!" It was a challenge and it was fun. Sessions vary, but it's not as if one's great and one's lousy. They all go differently.

CP: The only really hard ones are where the producer or the arranger is not sure what he wants and he's not open to what you have to say. You could say, "What really should be happening is this," but he doesn't want to believe it or something.

CD: Also there are times when the musicians are not on the same wavelength, not locked in. The music is waverin' and not groovin'. Or the engineer could be fouled up.

RT: It requires teamwork.

CP: The engineer has to be as interested in the music as the musicians.

RT: A good quarterback and a poor team don't amount to much.

MR: Have you found that through the years, the process of making a record has become more complicated?

CD: I find that there are more people involved and less music being played. It is less interesting to me.

RT: Even though you have all this 24-track business and everything else, when you do it "live" in the studio, it's still the same thing. The continuity, the idea that everyone is groovin' on the same thing is still the story. You all hear what everybody else is doing.

CD: It's the people that make it as complicated as it is.

CP: It's also the time factor. I often think that I like jingles better than record dates. With jingles, they only have an hour to get the thing right. Even though the music's going to be mixed way down, they still want it to be right. The engineers are moving back and forth, putting things here and there. "Time is money" and all that, of course.

RT: I like that [jingles] because no one's fartin' around. They're takin' care of business. If I can do something in five minutes why should I take a half an hour.

CP: Everybody's much more efficient when they know they have very little time. On record dates, sometimes, they can take an hour just to get a reading on a snare drum. I know how I feel and I know it drives other guys crazy. That has an overall effect on the whole record date.

CD: You know what's going to make things simple, is when they introduce a mixing board that the drummer and the other musicians can sit there and do their own mixing with.

RT: They have that.

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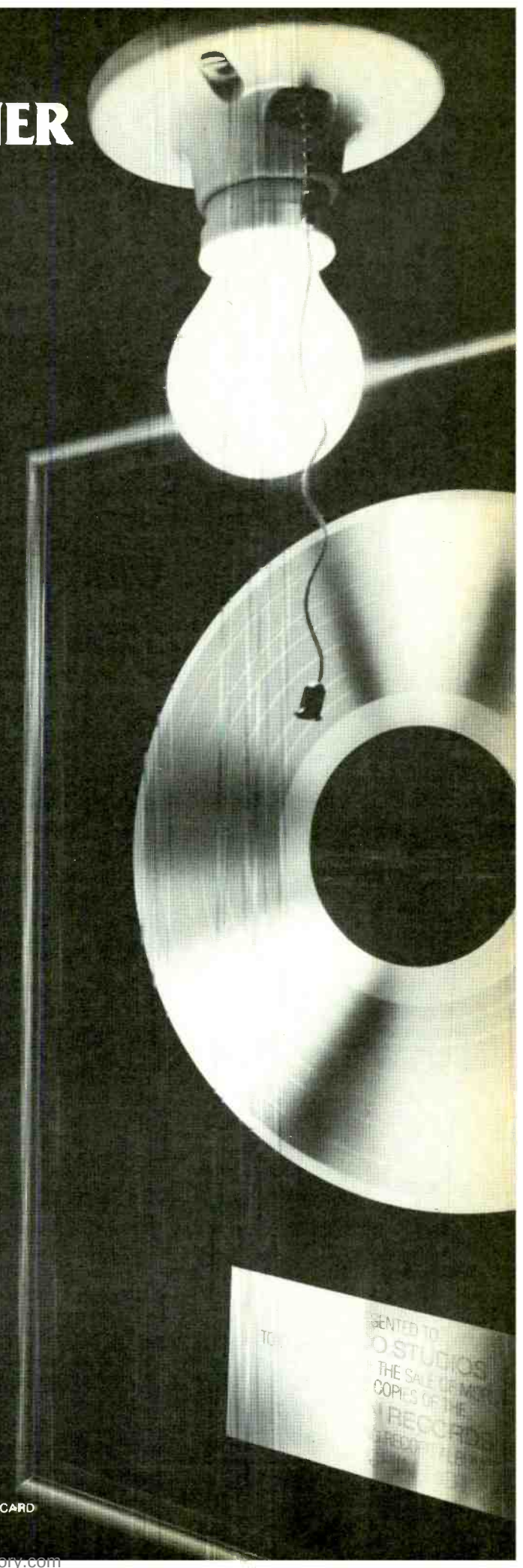


CIRCLE 96 ON READER SERVICE CARD

CD: Not here in the States.

CP: No, but they have it in Japan.

RT: You're talking about that thing we had on that session.

CD: That's the most modern thing that I've hit upon. While you're recording you can mix the sound for your earphones just the way you like it. Each person has his own little mixing box and a set of earphones. Eventually they should set it up so that you can have the option of having the tape inside the control room sound like each individual mix.

RT: That's eight different boxes. You can't play it back so that it will sound like eight different mixes.

CD: They can have some way of recording all the separate mixing information and applying it individually to the playback, so that you can hear Richard's mix, or Chris' mix. I find that it's the drummers who have the hardest time getting the sound that they want.

CP: I know. If you hear your bass drum hitting in the earphones real loud, it's real weird.

CD: On the playbacks, even when we were doing the Stuff recordings, you and Steve could never get the sound the way you wanted it to be. It's hard to translate the idea of how you want the drums to sound, the tones that you want. Deep, thick, thin, sharp, blunt, or whatever.

CP: You can't find the words. The sound of some old Elvis records have a particular sound. I don't know what it is, linoleum floors or something, one microphone. It's a great sound and it's hard to separate the elements of it. It's a great snare drum sound.

RT: It's like the old Motown drums.

CP: They have no tape [delay] on it, no nothing on it.

CD: All the sessions that I've done in Los Angeles . . . let's say you are scheduled to work from 3 o'clock until 6, everybody gets there at 3 o'clock. From 3 until 4 or 4:30, they work on getting the drum sound, and then everybody else comes in to get a sound. You're workin' from 5 till 6. Talk about laid back and not being straightahead. You'll get one song down depending on the budget that you're working on. "Hey guys, we can't get you today, come back tomorrow we'll do it then."

(At this point, Eric Gale walked into the room.)

CD: Hey Gale, just got off his motorcycle. We'd like to have some of your comments about recordings.

CP: We'd like to hear some of the things you say to engineers and producers when they're talking to you.

ERIC GALE: I didn't come in here for an interview, I just wanted to know if you had a medium-gauge pick.

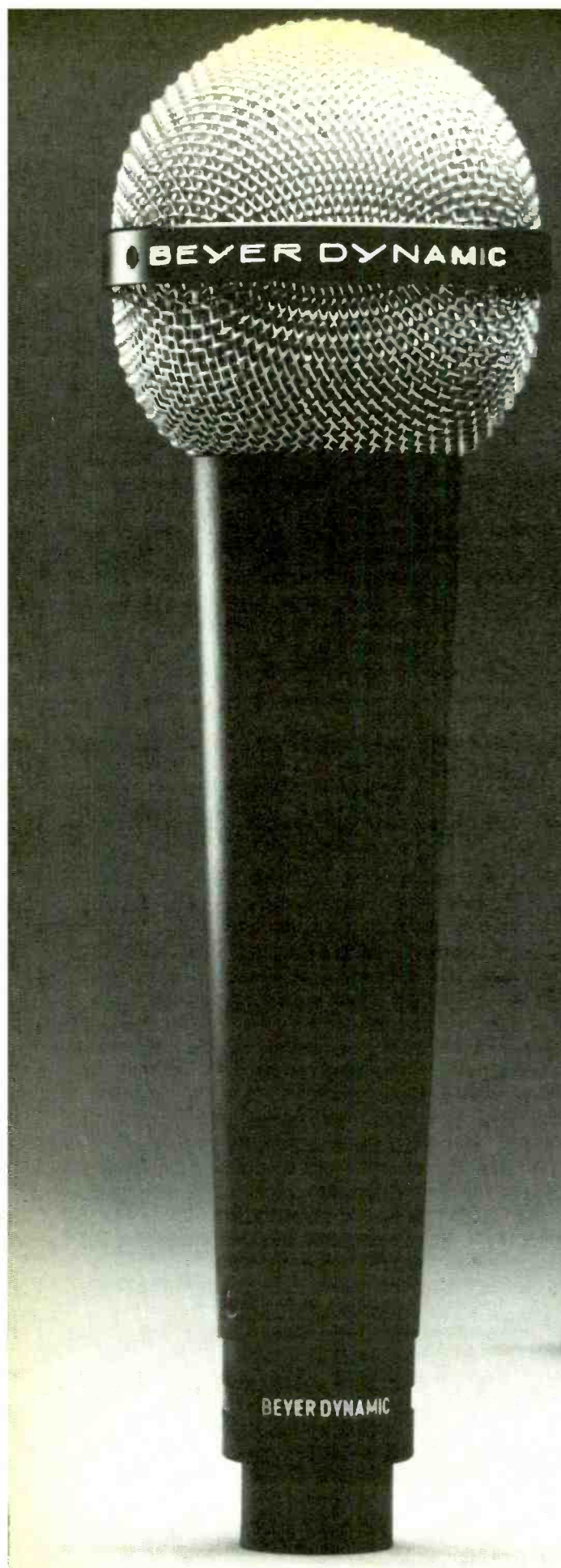
CD: I do have a medium-gauge pick. This particular pick won't break too easily because it is tortoise shell. You keep it under your hat because it's illegal to have it. I told them not to kill the turtle.

MR: Cornell, do find that you have greater respect for some of the older producers, like Jerry Wexler, than some of the newer guys?

CD: Not really. Producers are producers. You've got your good ones and your bad ones.

RT: Like anything else.

CD: It's pretty much the same: getting something interesting, and getting the right ingredients.



A RIBBON FOR THE ROAD

Beyer thinks the ribbon microphone is too good to be left behind. So we designed our M500, which comes with a protective carrying case, to stand up to the rigors of the road. It's a true handheld performer's mic that's ruggedly constructed for touring and remote recording, without sacrificing superior sound.

The heart of the M500 is Beyer's exclusive corrugated aluminum ribbon. Its extremely low mass not only makes it highly responsive to transients, but puts less strain on the points where it is attached to the transducer to stand the high SPL's of live performance. The transducer is in a protective subassembly, isolated by a resilient suspension system. And a special four-stage pop filter limits the sound pressure on the ribbon when a performer is working close to the mic.

We don't recommend the M500 for hammering nails or fighting off groupies. But it can do anything a mic has to do, anywhere it has to be done. We've made tens of thousands of them, and 99.5% are still on the road.

THE BEYER M 500

M 500 carrying case

Beyer Dynamic

BURNS AUDIOTRONICS, INC.
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CIRCLE 122 ON READER SERVICE CARD

Ambient Sound

BY LEN FELDMAN

Updating Amplifier Specs and Measurements

If you read the "Vital Statistics" table which appears in conjunction with Norman Eisenberg's and my report concerning the Cerwin-Vega Model 400 power amplifier [August 1979 issue] you will note that it has been expanded considerably compared with the number of measurements previously reported for amplifiers in our test reports. It's not that Norman and I have become more ambitious. Rather, an understanding of audio amplifier technology and design criteria has been growing within the audio industry.

For many years, the complaint of the purist amplifier "listener" has been that the standard, steady-state measurements which manufacturers of audio amplifiers had traditionally reported in their specification sheets had little bearing upon the way an amplifier actually *sounds* when reproducing musical or vocal signal waveforms. Which of us has not experienced listening to an amplifier rated at 1.0% total harmonic distortion and discovering that it sounded "better" than another amplifier, having a similar power rating, but a total harmonic distortion rating of only 0.1%—or even 0.01%? Clearly, we were either not measuring the right things, or else we weren't measuring some of the things that needed measuring.

Amplifier designers and engineers have been trying to find ways to correlate measured results with listened-to impressions for a long time. I would not dare to suggest that the new items now included in our amplifier-test "Vital Statistics" table come even close to solving the problem. But I do believe that *some* of them begin to tackle the problem in ways that haven't been practiced before. Since I am basically a technical person, I have to believe that someday we will be able to fully and completely measure the performance of an amplifier in terms that will tell the user what to expect when that amplifier is used in the reproduction of music. But until that time comes, we can at least increase the scope of our measurement techniques to keep pace with the latest measurement philosophies, as they are promulgated.

Simply to hit the reader of *MR* with a whole host of new numbers and but a brief explanation in last month's issue didn't seem entirely fair. So, I decided to devote this "Ambient Sound" column to a summary of what's behind some of the new amplifier data we will be providing in future power amplifier test reports. It will help if you flip back and forth to our Crown test report (and the accompanying "Vital Statistics" chart) as you read on.

IM Distortion, Rated Output SMPTE

There's nothing really new here, except for the fact that we are now identifying this IM distortion measurement for what it is: a two tone measurement consisting of 60 Hz and 7000 Hz, mixed together in a 4:1 ratio, as specified by the Society of Motion Picture and Television Engineers. When a low- and high-frequency mixture such as this is applied to an amplifier, the higher frequency may modulate the lower frequency, to produce sum-and-difference frequencies which were not in the original signal complex. Since such sum-and-difference components are not harmonically related to the desired signal components (are not multiples of either of them), the presence of this form of IM distortion, in small amounts, is subjectively more annoying than the same percentage of harmonic distortion might be. In the days of tube amplifiers, it was not unusual to find that SMPTE distortion often ran four times as high as harmonic distortion. With modern, solid-state amplifiers, SMPTE-IM is often as low, or lower than the total harmonic distortion and therefore is not as useful a measurement as it used to be.

CCIF IM Distortion

CCIF is the French abbreviation for the International Consultative Committee for Telephone and Telegraph and their method of IM measurement involves the use of two relatively high-frequency tones as a test signal. When these two signals (normally spaced 1 kHz apart) are passed through an amplifier, a certain amount of "difference" frequency may be produced at 1 kHz. In making this measurement, the two frequencies are mixed in a one-to-one ratio. The original, high-frequency signals are filtered from the output by means of a band-pass filter tuned to the 1 kHz difference frequency and the residual 1 kHz component is expressed as a percentage of the original signal peak-equivalent amplitude. This type of measurement shows up subtle differences between amplifiers

which neither THD nor SMPTE measurements would do, especially since high-frequency signals are used. For a complete measurement, you are supposed to try the test with several combinations of frequencies, always 1 kHz apart, but in my experience, the worst-case condition arises when the two frequencies used are 19 kHz and 20 kHz.

IHF IM Distortion

The newly approved Amplifier Measurement Standards developed by the Institute of High Fidelity take the two-tone IM measurement method a giant step beyond the CCIF approach. Instead of measuring only the 1 kHz "beat note" produced by an amplifier when it is fed with a pair of test tones separated by that frequency, the IHF IM test requires that all components of distortion arising out of intermodulation between the two test frequencies must be included in the final distortion percentage figure. What other components are likely to arise? Well, if the two test frequencies are labeled f_1 and f_2, there may arise components at f_1-f_2 (the previously noted 1 kHz) as well as additional components at such frequencies as $2f_1$-f_2, $2f_2$-f_1, $3f_1$-$2f_2$, $3f_2$-$2f_1$, etc., etc. Components caused by the "sum" of the test frequencies will generally be outside the audio band, and are therefore not taken into account.

One of the problems with this test is that the tester must have a spectrum analyzer on which to display these undesirable "difference" distortion components. Even with such an analyzer, the results, if they are to be expressed as a percentage figure, involve rather lengthy computations, since it is necessary to take the square root of the sum of the squares of the individual components observed, and divide that figure by the square root of the sum of the squares of the two test-tone amplitudes and multiply all of that by 100 to express the results as a percentage.

IHF S/N Ratio

Most manufacturers quote the signal-to-noise ratios of their amplifier products with reference to full, rated output. If you think about it, if you have a 10-watt amp and a 100-watt amp, both of which have the same residual noise level in absolute terms, the higher powered amp will always show a signal-to-noise ratio that is 10 dB higher than that of the lower powered amp. A better way of stating signal-to-noise of an amplifier is to reference it to a fixed level, preferably a level that is typical of average listening level. The IHF S/N ratio uses an output reference level of 1 watt and, to further insure that S/N ratios of different products can be meaningfully compared, the input reference level is also specified, as 0.5 volts. For the benefit of those manufacturers who have not converted to this preferred measurement method, we will continue to quote S/N referenced to rated output as well as the new IHF S/N figure.

IHF Dynamic Headroom

This new measurement is not really a qualitative one, but rather supplied for informational purposes. We have all experienced listening to two amplifiers, both of which carry the same power rating, only to find that one can actually play louder before clipping. The reason: amplifiers with less power supply regulation may produce much more short-term power than long-term continuous sine-wave power (used to determine their continuous power rating). Using a special test signal consisting of 20 milliseconds of a 1 kHz signal followed by 480 milliseconds of a lower-amplitude signal, we duplicate (or try to) the type of signals more likely to be present in music programming and, under those conditions, the amplifier whose power supply is not "stiff" will produce considerably more power than its continuous rating would indicate. The difference is expressed in dB and is the IHF Dynamic Headroom. I'd like to emphasize that high dynamic headroom is not necessarily a "good" feature, only one that is indicative of how much louder it can play than another amplifier with lower dynamic headroom.

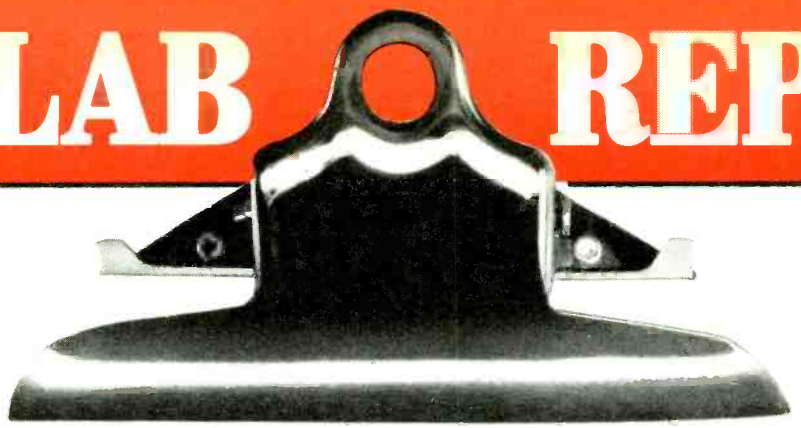
Slew Rate

Modern program sources, such as direct-to-disc records and, of course, signals picked up from high-quality microphones during "live" performances, often have extremely steep transients or rapid changes of amplitude. Early transistorized amplifiers were considered too "slow" to respond to such rapidly changing signals. Now, high-speed devices are used which can follow changing waveforms at an incredibly rapid rate. Slew rate describes the ability of an amplifier to handle such fast-changing signals and is expressed, simply, in volts per microsecond. In other words, the specification tells us how many volts of change can be presented to the output terminals by an amplifier in one microsecond. Some high-speed amplifiers are attaining slew rates up to and even exceeding 100 volts per microsecond!

TIM Distortion

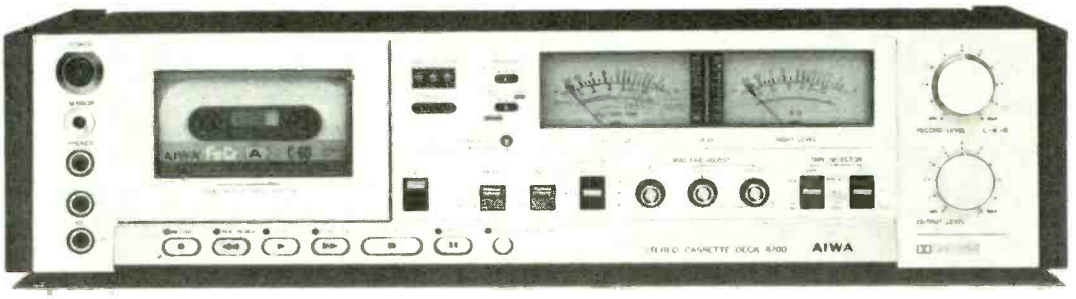
You'll note that we have still *not* incorporated a measurement of TIM (Transient Intermodulation) Distortion in our "Vital Statistics" charts concerning power amplifiers. That's not because we don't believe that TIM is a significant form of amplifier distortion. Rather, there is as yet no universally agreed upon technique for measuring TIM, though several excellent methods have been proposed. Further, we find that our two-tone IHF IM measurement together with the slew-rate measurement correlate pretty well with the degrees of TIM distortion you are likely to find in modern amplifiers, and so we are settling for these measurements for the present.

Our new version of amplifier "Vital Statistics" is not chiseled in concrete. I have no doubt that as the study of amplifier electronics goes forward, more and more measurement methods will be found which more closely quantify the subtle differences some of us hear when comparing the sound quality delivered from different amplifiers. As these newer methods are discovered and confirmed, we will do our best to incorporate them in our *Modern Recording* test reports.



NORMAN EISENBERG AND LEN FELDMAN

Aiwa AD-6700U Cassette Recorder



General Description: A front-loader, the Aiwa AD-6700U uses two heads (combined r/p) and two motors—one for reel take-up drive and one for capstan drive. The deck has metal-tape capability, logic-control transport keys that permit fast-button operation (including run-in recording, or, as Aiwa calls it, follow-up recording), a dual-purpose memory option (stop or replay), and several other features described further along. Supplied with the machine is a wireless remote-control unit that provides record, play, rewind, fast-forward, stop, pause and record-mute.

The front panel is fairly busy-looking. At the extreme left, from top to bottom, are found: the AC power off/on switch; the remote-control sensor (this feature works by infra-red ray); stereo headphones output jack; left and right channel microphone input jacks. Right of this group is the cassette area behind a swing-down door with a large transparent area. Below it are the transport keys. Included in this group is a rewind-review button which, if pressed during playback, will rewind the tape for as long as the button is held down. Releasing it resumes playback. During the record mode, pressing the r/r button releases the record button and starts rewind. Again, releasing the r/r button will start playback of the material just recorded. Associated with the fast-forward button is a cue function that permits the tape to shuttle rapidly but in contact with the r/p head, so that a high-pitched squeal—representing the sound on the tape—is heard.

One side of a tape may be played repeatedly by using the AD-6700U's timer switch in conjunction with the unit's memory switch.

Right of the cassette area are the tape index counter and its reset button, and the cassette-eject control. To the right of the counter is the memory switch, and just under it is the timer switch that permits—via an external timer—unattended recording or playback.

The two signal meters are VU types, calibrated from −20 to +5. In addition to these scales, there is a vertical multi-peak LED display marked from −15 dB to +10 dB centered between the meters. Associated with this display is a peak-hold button to the left of the left-hand meter. Also indicated on the peak-display are the legends for four tape types ("MT" for metal, "F-C" for ferrichrome, "LH" for low-noise standard and "Cr" for chromium-dioxide) which are so placed as to indicate relative peak recording levels at 3% THD for each tape formulation. A final fillip of the metering system is a special scale on the left meter that permits you to estimate remaining time for various sizes of cassettes. To activate this feature, there's a special meter switch.

This meter switch is the first in another group that extends across the panel under the meters. Next in line is an input selector to choose between line and microphone inputs (no input mixing is provided on the deck). The Dolby switch has three positions, one for engaging a multiplex filter.

Tape selection is worked out between the next three

knobs and two additional switches. The latter are for bias and equalization with marked settings for metal, FeCr and LH. CrO_2 selection is automatic, and the FeCr position also serves to equalize CrO_2 tapes on playback. The three knobs are for fine bias adjustments in recording, with one knob each for LH, FeCr and CrO_2. (Cobalt-treated tapes are handled by the CrO_2 knob). There is no fine-bias adjustment for metal tapes. Recommended settings of these controls, for various tapes by brand and type, are included in the owner's manual.

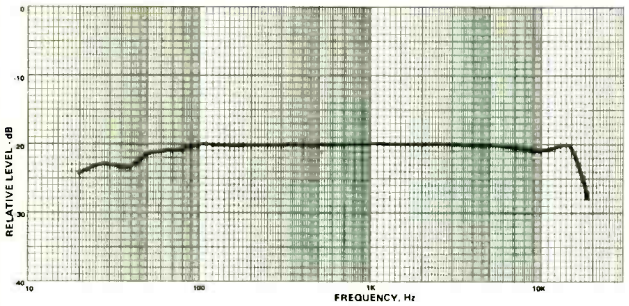
The remaining front-panel controls are a dual-concentric pair of knobs for input recording level, and a single knob for output level.

The line in and out jacks are at the rear. There also are an unswitched AC outlet, a ground terminal, and a special jack for a connecting cord to an Aiwa model AP-2200 or AP-2600 turntable by means of which tape recording may be synchronized with the operation of either of those turntables.

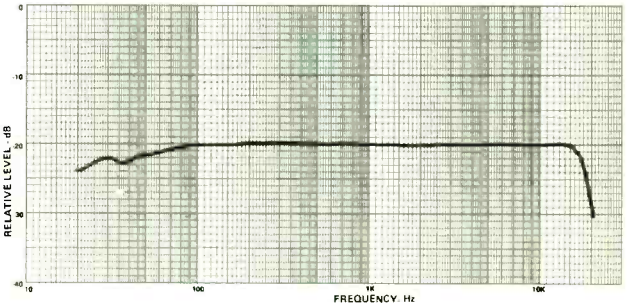
Test Results: *MR*'s tests of the Aiwa AD-6700U included, of course, measurements using metal tape—for which this deck is among the first to be offered. The results obtained here with metal tape indicate a definitely extended high-end response, a somewhat improved signal-to-noise ratio, a moderate rise in harmonic distortion, and a few dB less headroom.

With any tape, though, results were very good, generally exceeding specs. The record/play response curves for TDK-AD (standard), TDK-SA (high-bias) and 3M Metafine (the metal tape used by Aiwa for their spec) are shown in the accompanying graphs. In addition, we made a plot of playback-only response, using TDK's new test tape AC-337 which provides spot frequencies up to a top of 12.5 kHz.

Wow-and-flutter were extremely low, and speed accuracy was very high. All transport controls operated smoothly and flawlessly, and we found it im-



Aiwa AD-6700U: Record/play response, TDK AD C-90 (std) tape.



Aiwa AD-6700U: Record/play response using TDK SA C-90 (cobalt) tape.

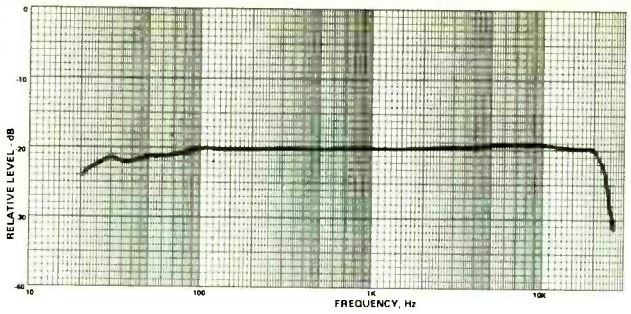
possible to jam the tape or to confuse the logic system, regardless of what combinations or sequences we used. The various features all operated as indicated. The one exception was the printed tape legends associated with the peak-reading LEDs. While our measured results did correspond closely with those measured by Aiwa, the midrange headroom for the metal tape read lower than for either the standard tape or the cobalt-ferric tape we used.

General Info: Dimensions are 18 $\frac{9}{16}$ inches wide; 4$\frac{3}{4}$ inches high; 12 $\frac{7}{8}$ inches deep. Weight is 22.5 pounds. Price of this Aiwa deck is $750.

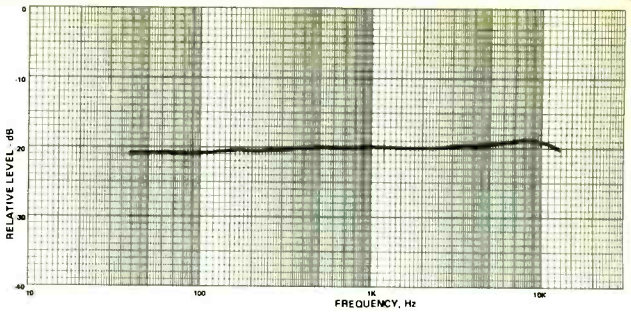
Individual Comment by L.F.: Even if price had been no object, I can't think of much more that Aiwa could have incorporated in the Model AD-6700U. In addition to being one of the first decks we have tested for *MR* that has metal tape capability, it also is one of only a few decks I have seen that includes complete remote-control operation.

A feature I looked forward to using was the remaining-time indicator. This proved somewhat of a disappointment since the time shown on the meter was, at best, approximate. In my view, anyone who has used a cassette deck for some time can approximate remaining time on the supply reel almost as accurately by simple visual observation.

I have, of course, been all in favor of vernier bias adjustments since that feature first appeared on the costlier models a couple of years ago. Not only do bias requirements vary from brand to brand of a given generic type of tape, but often the bias requirements may vary slightly from batch to batch of known tapes. I was, therefore, pleased to find three separate knobs for bias trim: one each for standard ferric-oxide, for ferrichrome and for chromium-dioxide or equivalent cobalt-ferric tapes. There was, however, no bias trim adjustment for metal-particle tapes. This omission I consider



Aiwa AD-6700U: Record/play response with 3M "Metafine" (metal) tape.



Aiwa AD-6700U: Playback-only response (using TDK AC-337 test tape).

unfortunate since my first experiences with metal-particle tape indicates substantial differences between the bias needs of those few examples that have already appeared on the market, or in prototype form. Thus, the results obtained using Scotch (3M) Metafine differed rather markedly from results obtained with TDK's new MA-R tapes. Aiwa did supply their own test data with this deck and, since they used 3M Metafine as an example of metal-particle tape, so did we, assuming that the deck was properly calibrated for this tape. While our measured r/p response did better than Aiwa's, our record level for 3% THD did not reach as high as indicated on the deck's LED scale.

Be that as it may, where the metal tape really excelled was at the high end of the audio spectrum. At zero-dB record level, we were able to obtain fairly uniform response with metal-particle tape clear out to about 12.5 kHz. If that does not seem impressive, try doing the same with any oxide particle tape.

The provision for sync with an associated Aiwa turntable, while not tested, seems to me a desirable feature if you are in the habit of transcribing your favorite discs onto tape and have better things to do than stand around waiting for completion of play so that you can turn off the tape transport or put it into pause mode between sides of a disc.

I also liked the cue-and-review feature associated with the fast-wind mode, and the timer and memory features that permit rewind to a pre-set "zero" on the tape counter, as well as repeat play.

This is indeed a lot of cassette deck for $750 and even if its frequency response falls somewhat short of the "20 Hz to 20,000 Hz" which high-fidelity component consumers seem to regard as the definitive performance specification of any tape recorder, those of us who care more about low distortion, low wow-and-flutter and good signal-to-noise ratio as well as dynamic headroom are likely to overlook that limitation. The key to good tape deck design is an intelligent balance of important specs. Aiwa seems to have attained that objective with their good looking AD-6700U.

Individual Comment by N.E.: The "medium-high" price of the Aiwa AD-6700U doubtless reflects its metal-particle tape capability (which involves not necessarily a costlier technology as such, but a few new twists which, being new, tend to cost a little more, at first anyway). In addition to this new capability, the deck incorporates many features and "extras." In terms of actual performance it is obviously very good, with more than competent audio response, low distortion, excellent signal-to-noise characteristics and better-than-average headroom. Its transport is a sophisticated, logic-controlled affair, with fast-buttoning and very low wow-and-flutter. Metering offers both VU and peak indications, and peak-hold facility is handy and helpful. The three front-panel bias trimmers are all to the good, but how come there's no fine bias adjust furnished for metal tape?

A two-head (combined record and play head) model, the AD-6700U does not permit direct off-the-tape monitoring during recording. Neither does it provide on-the-deck input mixing. These items could be important to some users.

The turntable sync option would mean something only to those who owned one of two possible Aiwa turntables. To all others it is of no value.

Most of the other features would have to be decided on a purely personal, subjective basis. For instance, some recordists like the high-squeal effect of the "review and cue" feature; some do not. The memory/repeat trick feature is a nice trick, but for me it falls into the category of "maybe," and only if other things I really want also are present. On the other hand, the time indicator, switchable on one of the meters, I do like—even an approximate indication of remaining tape time can often prove very helpful.

The owner's manual for this recorder strikes me as better than usual. It is well written and amply illustrated, and it contains some very ably phrased information on tape formulations.

Aiwa AD-6700U: Rear panel view.

AIWA AD-6700U CASSETTE RECORDER: Vital Statistics

PERFORMANCE CHARACTERISTIC	MANUFACTURER'S SPEC	LAB MEASUREMENT
Frequency response		
normal tape	± 3 dB, 25 Hz to 15 kHz	± 3 dB, 25 Hz to 16 kHz
high-bias tape	± 3 dB, 25 Hz to 16 kHz	± 3 dB, 25 Hz to 17.5 kHz
other tape (metal)	± 3 dB, 25 Hz to 17 kHz	± 3 dB, 25 Hz to 22 kHz
Signal-to-noise (re: 3% THD record level), Dolby out		
normal tape	NA	53 dB
high-bias tape	NA	57.5 dB
FeCr; metal	NA/NA	57 dB; 57 dB
Signal-to-noise as above, Dolby in		
normal tape	NA	62 dB
high-bias tape	NA	65 dB
FeCr; metal	65 dB; NA	65 dB; 65 dB
THD at 0 dB record level		
normal tape	NA	0.9%
high-bias tape	NA	0.9%
FeCr; metal	0.9%; NA	0.9%; 1.4%
Record level for 3% THD (0 dB = 142 pWb/m)		
normal tape	NA	+8
high-bias tape	NA	+7
metal tape	NA	+5
Line output at 0 dB	410 mV	360 mV
Headphone output at 0 dB	NA	125 mV at 8 ohms
Mic input sensitivity for 0 dB	0.25 mV	0.21 mV
Line input sensitivity for 0 dB	50 mV	44 mV
Wow-and-flutter, WRMS	0.04%	0.035%
Speed accuracy	NA	−0.04%
Fast-wind time, C-60	65 seconds	60 seconds
Power consumption	45 watts	25 watts

CIRCLE 35 ON READER SERVICE CARD

Crown PSA-2 Power Amplifier

General Description: Crown's model PSA-2 is a high-powered basic amplifier with the following conservative audio output power ratings for stereo use: 220 watts per channel into 8 ohms; 400 watts per channel into 4 ohms; 685 watts per channel into 2 ohms. In mono use, output power is 700 watts into 8 ohms; 1200 watts into 4 ohms. Of rack-mount width, the amplifier has a two-speed fan built into its rear. Also included is a push-button tone generator that provides a broadband noise signal for system checks. An adjustable-threshold compressor may be pre-set to limit the output to a desired level. The amplifier has a low-frequency load protection system and turn-on delay (which may be defeated by the user via rear-panel switches). A thermal-sensing power supply protection system prevents premature blowing of AC fuses.

The front panel contains the power switch (at the right) and two level controls for each channel (at the left). Centered higher up are LED indicators for overload, signal and standby on each channel plus one

showing power-on. Handles and rack mounting holes are at either end.

The rear panel looks "busier" than usual, with separate inputs for balanced and unbalanced lines; standard dual banana-plug outputs; switches for stereo/mono, low-F protect defeat, turn-on delay defeat; an AGC threshold adjustment; the test tone switch; a low-pass and high-pass filter switch for each channel; gain adjustments for each channel; and a shorting strap that may be removed, if needed, to isolate chassis ground from signal ground.

Offered primarily as a professional power amplifier for use in sound-reinforcement systems, the Crown PSA-2 uses "self analyzing" circuitry. This proprietary feature employs a built-in analog computer (in each half of the output stages) that monitors the output device junction conditions and applies limiting as needed. The amplifier's two channels are electrically separate, including the high-voltage transformers, so that the unit functions as essentially two independent amplifiers. In the (not too likely) event of a problem in one output channel, the other is not affected.

The AGC control may be used to hold the output signal to a constant level regardless of increases in the input. The thermal sensor is designed to automatically reduce the output signal to a safe level should the amplifier overheat due to cooling system failure. This feature thus keeps the output transistors from overheating. If the large power transformers become overheated due to excessive strain on the high-V supply caused by too low a load impedance, that particular channel goes into "standby" mode. When the transformer cools, the amplifier returns to normal mode.

Test Results: The Crown PSA-2 met or exceeded its published specifications handsomely. Power output was higher than claimed; distortion, lower. Combined with this high level of performance was what *MR's* testers feel is an unusually high order of reliability, thanks to the amplifier's "self-analyzing" circuitry and the many other safeguards built into the unit, not to mention the choice and use of transistors and other circuit elements that have been carefully built in.

The entire product is a thoroughly "professional" one, from inputs to outputs. Its "sound" also was judged to be utterly transparent, with noise and distortion levels well below audibility (in a few instances, even below the measuring capability of our test instruments). The built-in fan is practically inaudible at the slower of its two speeds. During bench-tests, the higher speed came on, but it did not do so when using the amplifier to drive very low-efficiency speakers for listening to material at high, room-filling volumes.

General Info: Dimensions are 19 inches wide; 7 inches high; 14½ inches deep. Weight is 57 pounds. Price is $1495.

Individual Comment by N.E.: This is the kind of amplifier one might expect from Crown International, an organization that for years has been known for nothing but the best in high-grade audio products for professional users and for the more affluent home audiophile crowd. One gets the impression that a good deal of planning went into this amplifier, not only to make it a top contender among today's high-powered units but also to solve several little "problems" for the pro user. For instance, the options that are available on the rear-panel balanced-input module; the elaborate load-protection measures; the very sensible front-panel LED indicator system; even such a thoughtful item as locating the heavy power transformers far forward on the chassis so that the center of gravity is closer to the front, thus making it easier to mount or dismount this 57-pound baby from its rack place.

Also commendable is the owner's manual which explains everything clearly and completely—and which should be read and digested thoroughly before attempting to use this amplifier.

Individual Comment by L.F.: To put it as simply and succinctly as I know how, this—the Crown PSA-2—is my idea of a professional amplifier.

Crown states that it provides more usable power per output device than was possible with previous designs. The claim seems valid.

You can talk about FTC power ratings all you like, but those of us who use high-powered audio amplifiers regularly know only too well that an amplifier's continuous sine-wave power rating offers little correlation with what you can get out of it when driving it with music signals and applying its amplified output power to a variety of loads that are anything but 8-ohm resistors. It is in the "real world" of sound reinforcement applications that the PSA-2 really shines. That's not to imply that the unit falls short of meeting any of its steady-state published specifications. Statically measured distortion levels are all well below audibility (see "Vital Statistics") and, in most cases, are far better than published limits. IHF IM distortion (which we feel tends to separate the just so-so amplifiers from the really superior products) is every bit as inaudible as the more easily measured THD and SMPTE IM.

To my way of thinking, however, all of the measurements are no more important in a professional amplifier than is its reliability and the assurance that it can take real punishment, day after day, and night after night in continuous service. Designers of amplifiers have long realized that the safe operating area of a power transistor varies depending upon the conditions under which it is operating. According to Crown, however, what was not known until now was how to evaluate the history of the transistor's operation and combine that with continuous operating information, using the combinations to optimize the use of the device. As a result, many amplifiers have been designed with circuits which limited output on the basis of voltage or current or a combination of both, according to a pre-calculated arbitrary number which, for the sake of safe operation, was derived from a

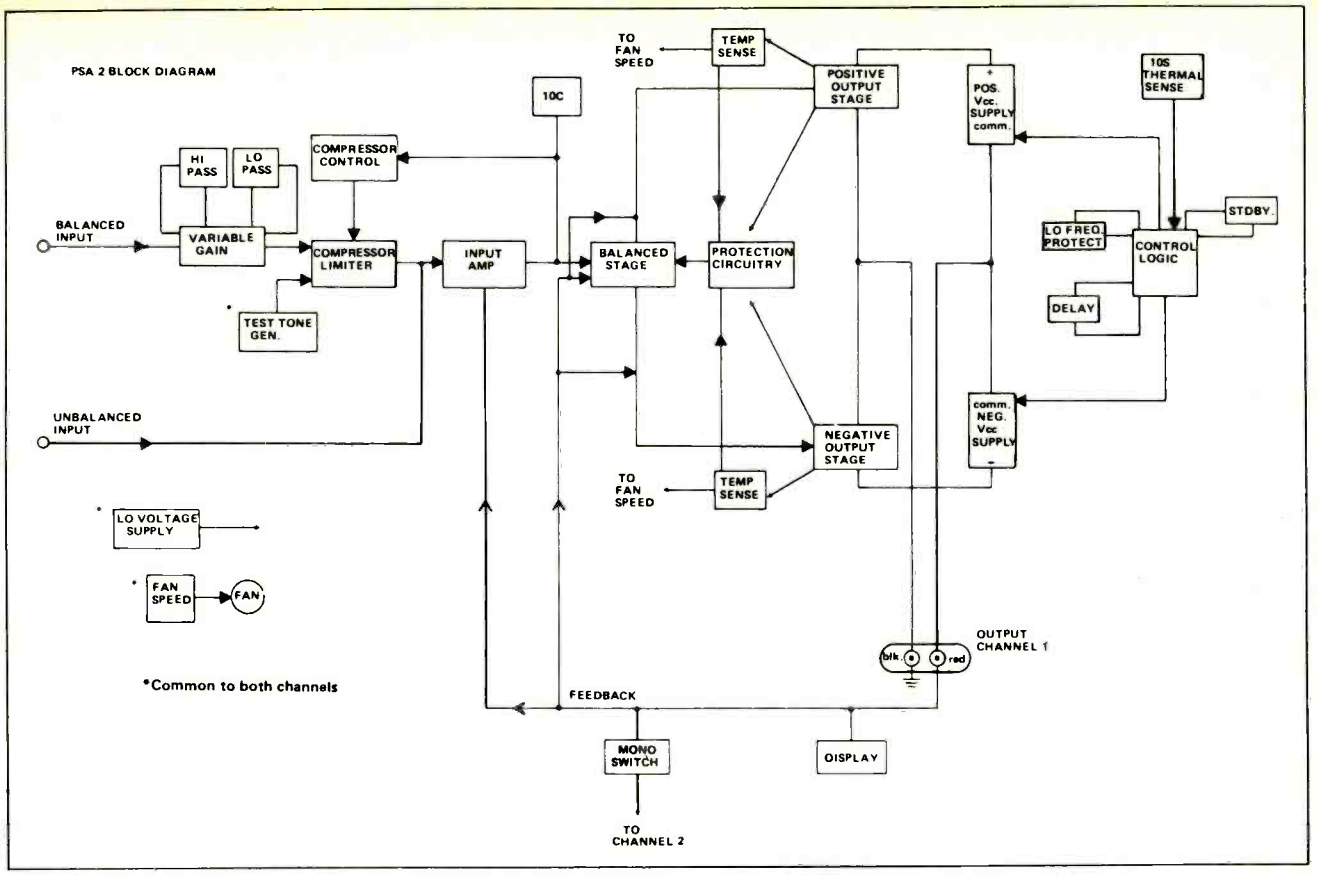


Fig. 1: Crown PSA-2: Block diagram of one channel.

worst-case condition.

Often, limiting or shut-down was applied when such limiting was really unnecessary; where the output device could have continued to function while remaining well within its safe operating area. The "self-analyzing" feature of the Crown PSA-2 is derived from these concepts. A research program for output devices provided the designers with data on Safe Operating Area of output devices under a variety of operating conditions. From this data, Crown's circuit designers were able to develop appropriate sensing and control circuitry. What amounts to an analog computer circuit integrates data from the operating history of the device and its present condition and decides whether that device is within the Safe Operating Area for those conditions. If it is, the unit is allowed to continue to operate. If safe limits are exceeded, the amplifier's output is automatically limited. What's more, the limiting is self correcting, so that as soon as the excessive stress to the output transistor has been removed, full power is automatically restored.

The end result of this design is that an unusual amount of power is available for driving speakers when the amplifier is processing music signals. While we could not verify the following experiments, Crown tells us that they have fed a pink-noise signal into the amp when it was hooked up to a 4-ohm load and their instruments indicated a peak power of 900 watts! With a 2-ohm load, the amp circuit developed 1500 watts of instantaneous peak power per channel!

The circuitry that does all this monitoring, sensing and thermal protection is quite complex and, since patents are still pending, Crown doesn't tell all in its owner's manual. Readers can get some idea of its operation, however, by consulting the circuit block diagram which is provided and which is reproduced in this report as Fig. 1.

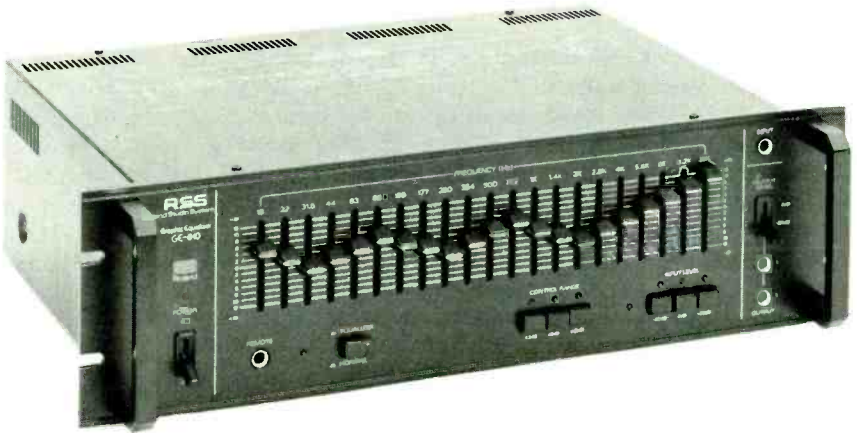
As for sound quality, the Crown PSA-2, once and for all, destroys the myth that professional amplifiers need necessarily give up those transparent sonic details which are heard when listening to some of the so-called esoteric high-fidelity power amps that audio buffs rave and argue about. In any event, I have no doubt about the success of the PSA-2 in professional applications. What I am wondering is how many serious audiophiles will take the unit into their homes as well, "professional" labelling notwithstanding. We should note, perhaps, that those professional audio people who do fall in love with the PSA-2 in the course of their work do have another option. With the introduction of the PSA-2, Crown has also made available a consumer version of the amp, known as the SA-2. Operating specs are the same and the "computer" protection circuits are included. In addition, the consumer version features power output indicating LED displays on the front panel instead of the "standby," "signal" and "overload" indicators found on the professional version.

CROWN PSA-2 POWER AMPLIFIER: Vital Statistics

PERFORMANCE CHARACTERISTIC	MANUFACTURER'S SPEC	LAB MEASUREMENT
Continuous power for rated THD		
(8 ohms, 1 kHz)	220 watts	250.8 watts
(4 ohms, 1 kHz)	400 watts	410.0 watts
FTC Rated Power (20 Hz to 20 kHz)	220 watts	220 watts
THD at rated output		
(8 ohms, 1 kHz)	0.05%	0.0044%
(4 ohms, 1 kHz)	1.0%	0.45%
(8 ohms, 20 Hz)	0.05%	0.017%
(8 ohms, 20 kHz)	0.05%	0.05%
IM distortion, rated output,		
SMPTE	0.01%	0.004%
CCIF	NA	unmeasurable
IHF	NA	0.05%
Frequency response		
(at 1 W, for −1 dB)	DC to 50 K	DC to 52 K
S/N ratio, re: 1 W, "A" wtd, IHF	NA	90 dB
S/N ratio re: rated output, "A" wtd	115 dB	115 dB
Dynamic headroom, IHF	NA	1.4 dB
Damping factor at 50 Hz	700	unmeasurable
Input sensitivity, IHF	NA	0.135 volt
Input sensitivity re: to rated output	2.2 volts	2.05 volts
Slew rate (volts/microsecond)	30	30
Power consumption (watts)		
idling	90	100
maximum	800	975

CIRCLE 36 ON READER SERVICE CARD

Roland Model GE-810 Graphic Equalizer



General Description: The Roland GE-810 is a single-channel (mono) 21-band graphic equalizer. Nominal half-octave frequency centers are 16, 22, 31.5 44, 63, 88, 125, 177, 250, 354, 500, 707, 1 K, 1.4 K, 2 K, 2.8 K, 4 K, 5.6 K, 8 K, 11.2 K, and 16 kHz. The twenty-one vertical sliders across the front panel move through an indicated range of +12 to −12 dB, marked in 2-dB steps, with a detent at 0 dB.

The control range actually is selectable by means of three pushbuttons on the panel which choose the full ±12 dB span, or a ±6 dB span, or a ± 3 dB span. Green LEDs indicate which range has been chosen.

A similar group of three pushbuttons chooses the input level, which may be −20 dB, 0 dB or +20 dB. Again, there are green LEDs to show which level is used. Just to the left of this group is a red LED which comes on when the output level reaches +17 dB in relation to the level chosen on the output level switch, which is located at the right and may be set for either 0 dB or −20 dB. Above the output level switch is a phone jack for input; below the switch are two phone jacks for outputs "1" and "2." These output jacks are wired in parallel, and are also tied to phone jacks (hi-fi pin types) at the rear. The front-panel input jack also is tied to a pin-jack at the rear. All the front panel jacks are switching jacks which, when used, cancel their corresponding rear connectors.

At the left of the panel are the power off/on switch

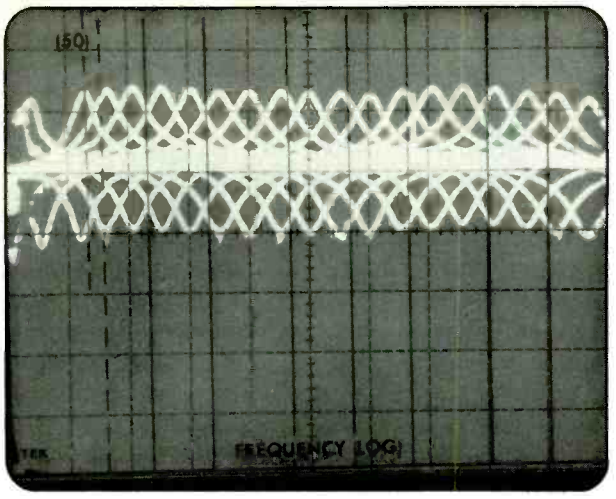


Fig. 1: Roland GE-810: Composite plot of boost and cut range of each of the twenty-one controls.

and a red LED pilot lamp. The front panel also contains a remote phone-jack for use with an external switch (such as Roland FS-1, FS-2 or DP-1) that may be used to defeat the equalizer circuitry. Alternately, this function may be carried out by the equalizer/normal switch, another pushbutton on the front panel. When the remote switch is used, a red LED comes on.

Of standard rack-mount width, the GE-810 is fitted with handles. It also comes with four feet for direct placement on a surface. Finish is black matte; lettering is white. The rear contains the in and out jacks mentioned above, and the unit's AC power cord. A block diagram of the circuit is printed on the top cover.

The internal view of the unit (see photo) discloses that no coils are employed in the filter circuitry. Instead, Roland has used IC op-amps, with R-C negative feedback, to create the necessary "gyrator" circuits for each of its twenty-one frequency bands. The single large p.c. board is well laid out and easily serviceable should the need arise.

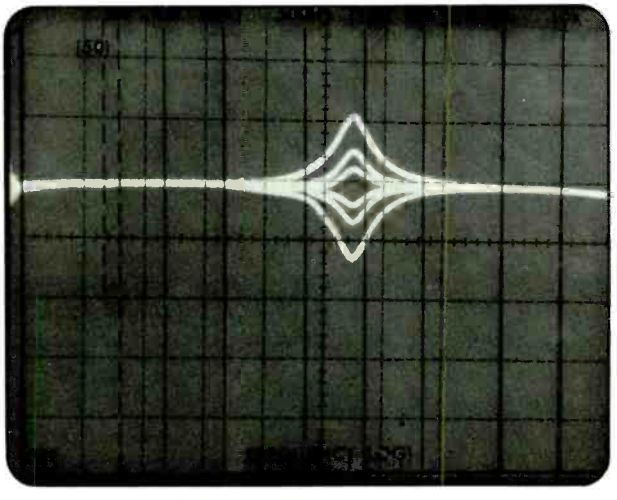


Fig. 2: Roland GE-810: Maximum boost or cut range can be set to ± 3 dB, ± 6 dB or ± 12 dB.

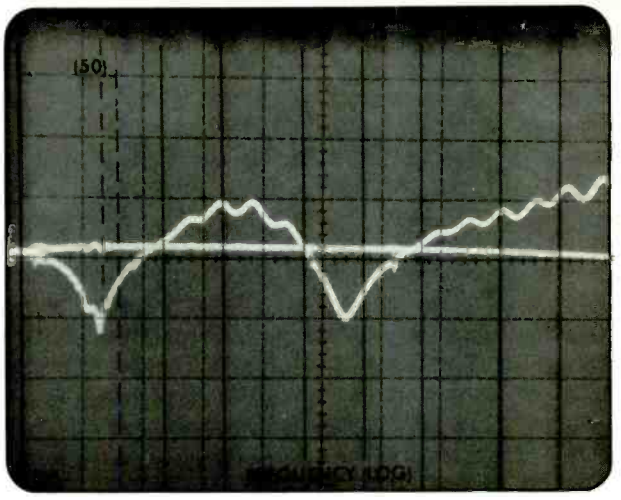


Fig. 3: Roland GE-810: Typical response curve obtained at output of equalizer with controls set as shown in Fig. 4.

Test Results: The Roland GE-810 met or exceeded all of its published specifications in our tests. Drawing a mere 5 watts of operating power from the line, it produced its requisite half-octave cuts and boosts as anticipated. Figure 1 is a spectrum analyzer plot of the range of each slider control when the range selected was ±12 dB. Each vertical division in this display is equal to 10 dB of amplitude change. Center frequencies were very nearly precise, and the seeming disparity in the spacing of the center frequencies at the very low end of the band was a function of the spectrum analyzer's own nonlinearity in that region, and *not* a flaw in the GE-810.

In Figure 2 we show maximum boost and cut range for a single control slider (at 1 kHz) when the range selector is set alternately for the three ranges of ±3, ±6 and ±12 dB. The advantage of this arrangement is that when precise, or relatively small, degrees of EQ are required, the long throw of each slider permits very precise adjustment on the lower two ranges.

Figure 3 shows a plot of the flat-response setting of the equalizer—i.e., with all controls set at their center (0 dB) points. Superimposed on it is an arbitrary EQ curve which corresponds to the way the sliders were set for the photo of Figure 4. The center-detents, by the way, make it easy to restore any slider to flat.

The block diagram of the circuitry reproduced in Figure 5 shows the great switching flexibility built into this unit. The front-panel LED indicators were found to be convenient and reliable; the red LED for

Fig. 4: Roland GE-810: Front panel view with control set to correspond to plot shown in Fig. 3.

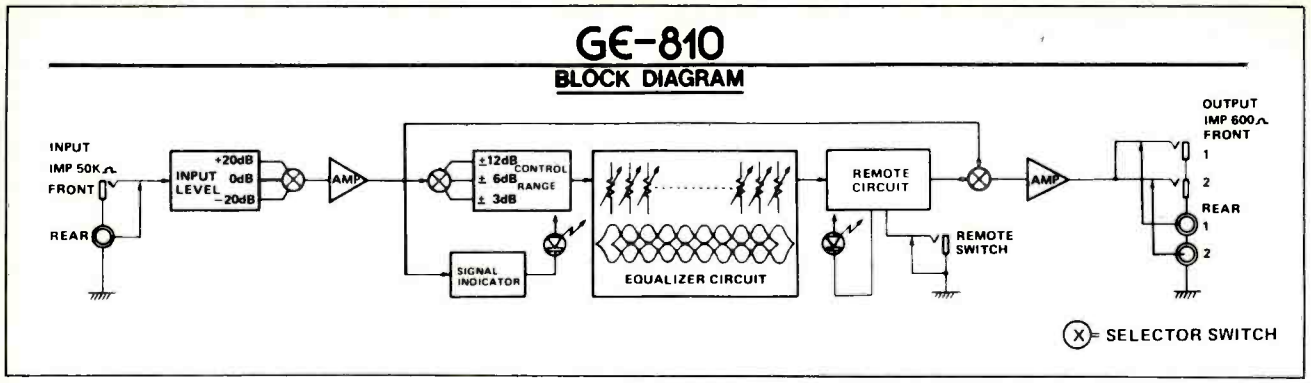


Fig. 5: Roland GE-810: Block diagram of the circuitry.

output level provides an accurate warning that signal levels are approaching distortion levels. The user then can punch in a higher input-level button.

Signal-to-noise ratio of the GE-810 was about as high as any measured by us for any equalizer, regardless of price. Harmonic distortion levels were so low that they could very well have been determined more by the residual distortion of our signal generator than by actual distortion produced by the GE-810.

General Info: Dimensions are: 18.9 inches wide; 5.35 inches high; 13.46 inches deep. Weight is 16 pounds. Price is $695.

Joint Comment by N.E. and L.F.: Despite the use of hi-fi type pin jacks at the rear, the GE-810 is a unit obviously aimed at the professional user. Half-octave equalization on one channel is hardly what your typical home stereo buff is likely to buy, let alone use correctly without the aid of additional instrumentation. Roland calls the unit a "studio system" which may seem surprising in light of those rear hi-fi jacks and the fact that input and output terminals are unbalanced. The front panel jacks are, of course, ¼-inch standard phone jacks. (The unit is supplied with a single standard cable terminated with a ¼-inch phone plug at one end, and a hi-fi pin plug at the other end, but with an adapter from pin-tip to phone plug. And while the outputs are unbalanced, the output impedance is 600 ohms, so the unit does lend itself to professional applications where balanced lines are used, if a suitable transformer is interposed between the output and the components that follow.

In any event, the electronics of the GE-810 are nothing less than superb, and the device has just about every sophisticated control feature one could want. It is, in fact, the first equalizer we have encountered that provides three selectable control ranges, including that very small ±3 dB range which permits extremely precise adjustment of an overall system response curve. The audible effects of these adjustments are quite revealing in terms of the coloration effects or the elimination thereof, possible in a given program.

ROLAND GE-810 GRAPHIC EQUALIZER: Vital Statistics

PERFORMANCE CHARACTERISTIC	MANUFACTURER'S SPEC	LAB MEASUREMENT
Nominal input level	+20 dBv, 0 dBv, −20 dBv	Confirmed
Input impedance	50 K ohm, unbalanced	Confirmed
Output levels	0 dBv or −20 dBv	Confirmed
Maximum output level	20 dB above rated output	+28 dB for −20 dBv +26 dB for 0 dBv
Output impedance	600 ohms unbalanced	Confirmed
Frequency response	+0, −1 dB, 10 Hz to 40 kHz	+0, −1 dB, 10 Hz to 60 kHz
Gain	0 dB, ±1 dB	0 dB, ±0.1 dB
Harmonic distortion	0.004% @ 1 kHz, 0 dBv	0.002% @ 1 khz 0.003% @ 20 Hz 0.0028% @ 20 kHz
Signal-to-noise ("A" weighted)	100 dB	102 dB
Frequency level control range	±12 dB, ±6 dB, ±3 dB	Confirmed
Power consumption	6 watts	5 watts

CIRCLE 37 ON READER SERVICE CARD

Time for a change? . . . MAINLINE™

MAINLINE . . . is a Trade Mark of J H D Audio

IT HAD TO HAPPEN . . .

We're all too aware of the vast amount of audio cable used on stage and in studios today. The cost of wire connectors and assembly time is astounding! Now, imagine if you could reduce your cost and trouble by eight times, while dramatically improving your sound in the process. Fantasy? We think not. The recent introduction of the incredible MAINLINE by J H D Audio is a reality! It is perhaps the most significant advance in audio technology of this decade.

WHAT IT IS . . .

The MAINLINE will encode and combine eight signals and transmit them up to 600 ft. using only one standard microphone cable. It will then decode each one for mixing resulting in eight separate signals. MAINLINE has no gain loss (it actually increases gain). It will reject CB and RF interference. Above all, it improves microphone performance by expanding dynamic range, extending frequency response, and drastically reducing hum and noise.

HOW IT WORKS . . .

MAINLINE employs analog and digital technology to create a unique "time domain multiplexing system" specifically designed for high quality audio reproduction. The system contains two modules connected by a standard microphone cable. The eight channel input module is located on stage. This stage module encodes and transmits data to the output module (at the console) which decodes the signals and feeds the mixer. There are three different MAINLINE encoder designs. One for balanced lo impedance microphones; one for hi impedance instruments; another for mixer output signals. The decoder module has output levels that accommodate all mixers and/or amplifiers. The MAINLINE comes standard with a 100 foot cable. It is calibrated to operate with cable lengths of 25 to 600 feet without sacrificing performance (MAINLINE could be adapted to perform at any distance).

WHAT IT ALL MEANS . . .

. . . It means you can send all the guitars and keyboards from the stage to the mixer on one line of your existing microphone snake. MAINLINE eliminates costly balancing transformers and tons of additional cable. You save money, time, and hassle. It's simpler, more reliable, and most important, the music sounds much better!

. . . It means simple, quick system expansion for club, church or studio without costly new cable installation. Each existing built-in microphone cable can now carry either eight microphones or eight instruments.

. . . It means an engineer can now run a stereo tri-amp sound system with the crossovers located at the mixer allowing balance control during performance. The six separate line sends can be carried by any one channel of a microphone snake, with two sends to spare!

. . . It means live 24 track direct stage recording on three standard microphone cables offering dynamics and audio fidelity never before possible outside the studio. In addition, you can set-up and record from virtually any remote location.

. . . It means a keyboard player can do his own mix on stage and send his keyboards direct for a separate main mix.

. . . It means the often unreliable hand-soldered connections are reduced 90%.

. . . It means the wire required in a conventional 16 channel, 100 ft. cabling system will be reduced from 3,300 to 600 feet. This saves money, time and weight. More important, without 2,700 feet of excess wire weighting down the signal, your music emerges with its dynamic character intact. And that's what live music is all about!

DOWN THE LINE . . .

All this is possible right now. Imagine however, what this breakthrough means for the future! MAINLINE sets new standards for audio performance (live or in studio). It has eliminated one of the most common deterrents to audio excellence . . . loss of signal quality due to too much cable.

MAINLINE also eliminates the need for massive quantities of transformers and 3-pin connectors . . . greatly reduces set-up time . . . requires no maintenance . . . could cut the cost of a typical 16 channel system by 40% while improving reliability, flexibility and sound quality.

Perhaps MAINLINE's only drawback is that is took so long to get here!

WHERE TO BUY IT . . .

With the exception of a few select audio dealers and commercial sound contractors, MAINLINE hasn't been available to the public. General distribution is 12 to 18 months away.

ASPEN & ASSOCIATES was conceived after years of experience in music, to introduce new technology and innovative products to the performing music commmunity. We're sure you will agree that MAINLINE falls into this category. So we have secured a supply of MAINLINE's from J H D Audio and will be offering them for sale starting July 1st, 1979.

All three systems are eight channel expander models designed for either direct instrument sends, balanced lo impedance sends, or line level mixer returns. Each MAINLINE includes an encoder module, a decoder module, a 100 ft. connecting cable, and eight output patch cords. The price? $500 for an instrument send or mixer return system . . . $550 for the balanced lo impedance system.

ASPEN & ASSOCIATES guarantees each MAINLINE we sell. If not completely satisfied with its performance, we'll refund the purchase price plus shipping. To order MAINLINE, just call ASPEN & ASSOCIATES, Monday thru Friday, 9 AM to 4 PM (PST).

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CIRCLE 101 ON READER SERVICE CARD

TAPCO C-12 Mixer

By John Murphy and Jim Ford

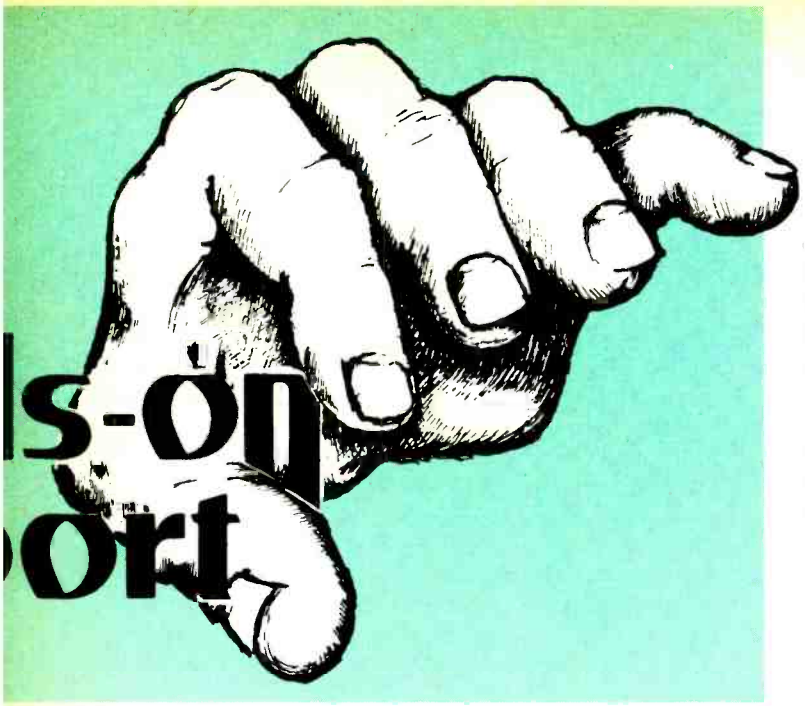
The new C-12 mixer from TAPCO is a highly flexible control center suitable for both P.A. and sound recording applications. Up to twelve inputs can be mixed down to four track, stereo or mono. When used as a mono mixer there are four sub groups available, and for a stereo output, two sub groups can be used.

Each input channel incorporates a pre fader monitor send, a post fader effects send and an aux send which can be used either pre or post fader. The EQ section provides variable high and low frequency shelving as well as a mid frequency boost/cut control with variable center frequency. The flexibility designed into this mixer is evidenced by the front panel patch bay which provides a normalled send and return for each input channel as well as direct channel outputs which are especially useful in recording. The board's soloing system can be used in both P.A. and recording applications and the metering is double duty allowing the meters to be switched in pairs to monitor the effects/monitor sends or the solo/mono levels in addition to the levels at the four sub masters. The board also provides phantom powering for condenser mics. The price of the TAPCO C-12 is less than $2000.

General Description: Upon first sight the C-12 mixer looks very strange. It appears as though someone has bent the rearmost portion of the chassis upward about 45 degrees to provide better access to the rear. And in fact this unique chassis design does give the user very good access to the rear panel. The top surface of this "bent" portion of the unit provides an excellent location for the four large VU meters since it considerably improves their visibility. The area to the left of the meters is occupied by two rows of input channel access patching jacks (sends and returns) and a third row of jacks for channel direct outputs. The access jacks (¼-inch phone jacks) have the sends and returns normally connected ("normalled") and this connection is broken only when a plug is inserted in the return jack. The access point occurs after the channel preamp and before the channel EQ and fader.

The surface below the VU meters is dominated by the controls for the twelve input channels. These controls are neatly grouped in vertical columns above the individual channel faders. At the top of each column is a pushbutton switch for selecting either the mic or line input to that channel. Just below this switch is an LED peak overload indicator for the channel. This indicator senses overload conditions at both the preamp output and the fader amp output. The next control is a rotary preamp gain control labeled "Trim" which determines the actual gain of the preamp for either mic or line inputs. It is calibrated for +4 dB and −10 dB line input levels as well as −20 dB to −50 dB mic input levels. The mic input is transformer balanced with 48-volt phantom powering applied at a center tap on the transformer primary. The phantom powering is switchable and is for use with condenser mics specifically designed to employ "phantom power."

Just below the input controls is a group of three rotary controls for adjusting the level of monitor, aux and effects sends in that order. The monitor and effects send levels operate in the normal manner with



clockwise rotation providing increased level at the send output. The monitor send is pre-fader so that the stage monitor mix can be established independently of the channel fader levels. In recording applications the monitor mix would usually be used to provide a headphone cue mix for the musicians. Unlike the monitor send, the effects send is derived after the fader (post fader) in order to maintain a fixed ratio of dry to effects signals as the channel fader level is varied. The aux send level control has a center rotation detent and can provide either pre or post fader signals depending on the direction of rotation. Clockwise rotation provides an increasing level of post fader signal at the aux send; counterclockwise rotation provides an increasing level of pre-fader signal. The center position is off.

Moving down the input section we next encounter the EQ controls. The high-frequency control provides a nominal 18 dB of boost or cut at about 10 kHz (see the accompanying response plots) while the low-frequency control provides about 18 dB of boost/cut at 100 Hz and below. Both of these are "shelving-type" tone controls. The midrange EQ pot provides about 12 dB of boost/cut over about a two and a half octave wide band. A second control allows the center frequency of the EQ board to be varied from 300 Hz to 6 kHz.

Next are the channel assign and pan controls. The signal from any input module can be assigned to any or all the sub groups 1, 2, 3 or 4. Subs 1 and 2 serve as a stereo pair (1/2:L/R) along with subs 3 and 4 (3/4:L/R). These pairs are combined to provide the stereo output from the board. The input signal can be assigned to either or both stereo buses. For a mono output, the pan control can be used to assign the channel output to either subgroup of the pair selected.

Beneath the channel assignment controls is the solo button and finally the channel fader. When a solo button is depressed the output of that channel is added to the solo bus and the stereo signal to the headphones is replaced with the signal on the solo bus.

The remaining controls on the console are located to the right of the input channels. Near the top of the console are the master send level controls and solo buttons for the monitor, aux and effects sends. Just to the right are level controls and pan pots for effects returns A and B. These two returns are identical with each injecting its signal into the stereo summing amps. The meter switching controls are just below the send master level controls. These consist of two push buttons which select alternate inputs for the meters in pairs. Normally the meters monitor the four submaster signals. Meters 1 and 2 can be switched to reflect the monitor and effects master send levels and meters 3 and 4 can be switched to monitor levels on the solo bus and at the mono output, respectively. This double duty metering system makes efficient use of the available metering.

Next in line below the meter switching buttons are the solo level control and solo status indicator. The solo status indicator illuminates whenever there is a solo button depressed to let the operator know that the stereo headphone signal has been overridden by the solo signal. There is also a "Solo to Mains" button which when depressed causes the stereo and mono outputs of the board to follow the solo system just like the headphone output. TAPCO suggests using the solo-to-mains function when using the C-12 as a recording board with the control room monitors fed from the stereo outputs. This will allow soloing into the control room monitors. The solo level control determines the overall level of the solo signals.

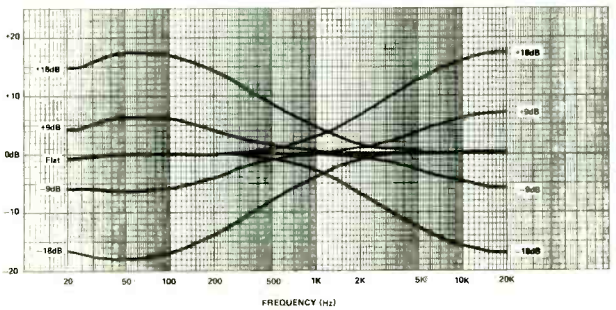
Above the four submaster faders is the stereo master level control. The position of this large rotary control determines the level of the stereo and mono signals leaving the board. Sub masters One and Two serve as one stereo group while submasters Three and Four serve as a second stereo group. For mono applications these can be considered to be four separate sub group level controls.

The front panel of the mixer contains the AC power on/off switch as well as a switch for turning the phantom mic powering on and off. The stereo headphone jack is at the far left of the front panel. The headphone level control is above and to the right of the stereo master level control. The mic and line inputs to the C-12 are located on the rear panel adjacent to the associated input channel. The mic inputs are by way of the three-pin, XLR-type connectors. All of the other

inputs/outputs on the unit employ ¼-inch phone jacks. There are three rows of jacks to the left of the channel inputs. The top row of eleven phone jacks is labeled "stacking input." These inputs allow additional signals to be summed into the monitor/effects buses, the solo system, the stereo outputs or the four submasters. The solo stacking input has a control input associated with it to allow remote soloing of the stacked solo input.

Below the stacking inputs there is a row of eleven outputs. Starting from the left there are the monitor and aux sends followed by hi- and lo-level effects sends. Next in line are the mono and stereo outputs followed by four submaster direct sends. Below the sub sends are four sub returns. The sub sends and returns are normally connected and are interrupted only when a plug is inserted in the sub return jack. This arrangement allows outboard devices (compressors, equalizers, noise gates, etc.) to be patched in at the sub master level. There are four effects return jacks to the left of the sub returns. These are for hi- and lo-level inputs into the separate A and B effects return systems. The only other items on the rear panel are the line cord and a line fuse holder.

Field Test: We had the fortunate opportunity to field test the C-12 by using it to do a stereo P.A. mix in a local club for "Squeeze," an Oklahoma City based rock group. We arrived on the scene a little too late to



TAPCO C-12: High and low frequency EQ response.

use the C-12 for the group's first set of the evening so we just enjoyed the music and waited for the first break. By the end of the 15 minute break we had the C-12 interfaced with the system and checked out.

We had four vocal mic inputs, two mic inputs for kick drum and drum overhead, and three mic inputs from guitar amps. The vocals were all assigned to stereo outputs 1 and 2 while the drums and guitars were assigned to the second stereo group, outputs 3 and 4. The stereo output of the board was then used to feed the biamped stereo P.A. system.

The monitor output was used to return the vocals to the stage monitors and an appropriate monitor mix was set up on the input channel monitor level controls. It was convenient to audition the monitor mix in the headphones by simply soloing the monitor send.

The only outboard effect used was an instrument level reverberation unit. This was easily accommodated by the C-12 by using the low-level effects send and return connections. Reverberation was added to the vocals by advancing the appropriate effects send controls on the input channels. We used the aux send pre fader to add reverb to the guitars. The aux send was routed to a second input on the reverb unit where it was combined with the effects send signal. This allowed us to use effects on the guitars even when the individual guitar faders were all or most of the way down. This approach is preferred because frequently the level from the guitar amp alone is sufficient and no P.A. reinforcement is required. However, even with the guitar faders all the way down there is still a pre fader aux signal available for use as an effects send. This way effects could be added to the guitars even when the dry signal was not used in the P.A. This is not possible with the effects send because it is past fader and is therefore dependent on the fader level. The effects were returned to the board through effects return A and panned center.

In order to minimize potential for feedback in the Main system, the signals from the mics at either end of the stage (closest to the P.A. speakers) were panned about half way to the opposite side. This way most of the signal from the singer at the far left of the stage was reproduced by the right side of the P.A. system and most of the signal from the singer at the right side of the stage was reproduced by the left side of the P.A. system. As a result, each of these singers was effectively placed further from the P.A. speakers than if a mono P.A. system had been used, and therefore the system was less prone to feedback.

With the C-12 in place the group returned to the stage to start its second set of the evening. We were able to quickly set rough mix levels with the input trim control while leaving the faders at a nominal level. Then the mix was fine tuned through use of the faders. Switching the meters over to monitor the effects and monitor send levels helped to establish proper levels on these lines. The C-12 gave an admirable performance for the rest of the evening with no surprises or disappointments. The only problem we encountered was in taking it home—the group wanted to keep it!

Back at the shop we conducted our usual listening test by inserting the C-12 in our reference system and listening to some direct to disc music through it. The output level of the unit was carefully set so that there was no overall level change when it was alternately switched in and out of our system via the tape monitor loop. With nominal (0 VU) levels through the board there was audible degradation of audio quality when listening through the unit.

Lab Test: Table 1 contains a summary of the lab test results on the C-12. The mic and line inputs have plenty of gain and enough headroom so that signal overload should never be a problem in normal use.

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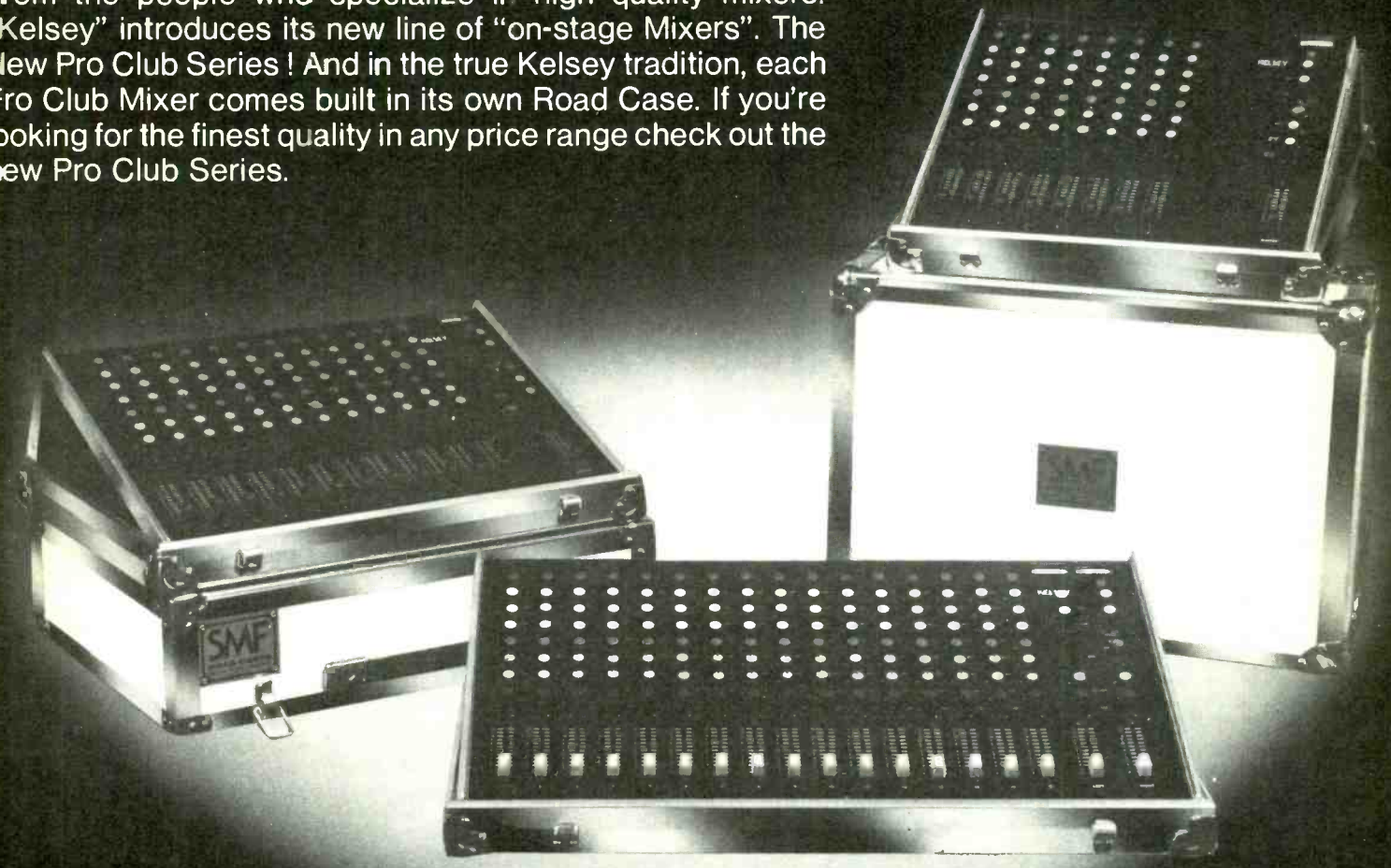

Pro Club Series Mixers are available in mono and stereo with these standard features:

- **L.E.D. on each input**
- **Transformer Balanced Inputs**
- **Variable Input Gain Control**
- **3 Bands of EQ**
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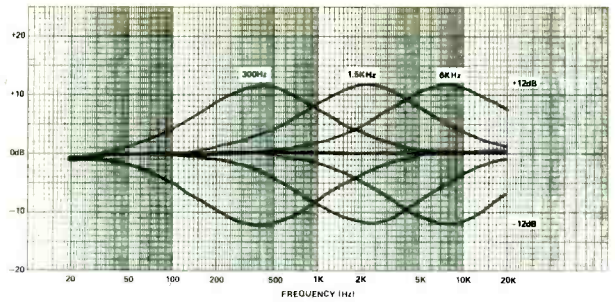

TAPCO C-12: Midrange EQ response (full boost/cut).

Even though there is no pad on the mic input, overload is very unlikely as it takes a +2.5 dBv signal to clip the input when the preamp gain is all the way down. Signals approaching this high a level belong in the line input which can handle up to +32 dBv before clipping.

For a 0 VU level signal through the unit, the output was about +1 dBv with the stereo master level in the calibrated position. The stereo master can be adjusted if higher or lower level are required. The maximum signal level out of the board was +20 dBv. This should be enough level to drive any amplifier or tape machine.

The noise from the mixer was measured using 200-ohm loads on the mic inputs and with a 20 kHz bandwidth on the voltmeter. The equivalent input noise was −125.6 dBv which is a very low noise level. With eight channels set for nominal mic input levels the noise at the output was about 70 dB below 0 VU. For a 0 VU level test signal, total harmonic distorton (THD) through the board was typically about .01% from 100 Hz to 10 kHz rising only slightly at 20 kHz. This suggests that slewing induced distortion should not be a problem with the TAPCO C-12.

When a 0 VU level square wave was put through the console a signal slew rate of .18 volts per microsecond was observed. Increasing the level of the test signal revealed a maximum slew rate or slew rate limit of 1.0 volts per microsecond. Since the peak voltage swing at +20 dBv is about eleven volts, the ratio of maximum slew rate to peak voltage swing (slew rate ratio) is about 1/11=.09 (volts per microsecond per volt of peak output). For a 0 VU level signal with +1 dBv level out, the peak voltage swing is only about 1.23 volts and the slew rate ratio is 1/1.23=.81. In order to avoid slewing induced distortion a slew rate of 0.5 (minimum) to 1.0 (conservative) has been recommended.[1] At 0 VU with nominal signal levels the C-12 meets this criteria. However, at its maximum output level the C-12 falls short of this criteria (slew rate ratio=.09). In use, slewing induced distortion can be avoided by keeping output signal levels less than about +5.2 dBv. This will insure that the slew rate ratio does not drop below 0.5. Slewing headroom could be improved by using faster op amps throughout or at least in the last stages.

[1]Jung, W.G.; Stephens, M.L.; Todd, C.C., "An Overview of SID and TIM Part II," *Audio* (July 1979), 47.

TAPCO provides an excellent owners manual for the C-12 in which they discuss both recording and P.A. applications for the board.

Conclusion: The TAPCO C-12 mixer is highly flexible with patching access to both the input channels and the submasters. It is well suited for either P.A. or recording applications and is capable of delivering a high level of audio quality. We recommend it without any hesitation whatsoever.

LAB TEST SUMMARY

Input Levels
(Note: 0 dBv = .775 VRMS)

Mic input

Mininum input level for 0 VU indication with all level controls at maximum: − 71.4 dBv
With preamp gain at minimum the input clips at: + 2.5 dBv

Line Input

Minimum input level for 0 VU indication: − 41.1 dBv
Input clips at: + 32.6 dBv

Output Levels
(at Mono output)

For 0 VU indication with the stereo master control in the nominal (calibrated) position: + 1 dBv
Maximum output level before clipping: + 20 dBv

Noise
(Note: 20 kHz bandwidth, 200-ohm mic input load, unweighted)

Equivalent Input Noise: 125.6 dBv
With all level controls for one input and one output at maximum and the stereo master at the calibrated setting noise is: − 54.2 dBv
With all level controls at minimum noise is: − 77.5 dBv
Input channel faders of one channel at nominal settings and the mic preamp set for − 40 dB input noise is: − 73.6 dBv.
With 8 channels set as above noise is: − 70.6 dBv

Distortion
(THD) at 0 VU

Frequency (Hz)	% THD
100	.012
1 K	.012
5 K	.012
10 K	.011
20 K	.014

Slew rate at 0 VU = .18 volts per microsecond.
Maximum Slew Rate (Slew Rate Limit): 1.0 volts per microsecond
Slew Rate Ratio at 0 VU: .81 volts per microsecond per volt (see text)

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CIRCLE 72 ON READER SERVICE CARD

GROOVE VIEWS

Reviewed by:
ALLAN KOZINN
STEVE CAPUTO
ROBERT HENSCHEN
MIKE DEREVLANY
STEVE ROW
JOE KLEE
NAT HENTOFF

POPULAR

JETHRO TULL: *Bursting Out.* [Ian Anderson, producer; Robin Black, Christopher Amson, Pavel Kubes, engineers; recorded "somewhere else in Europe by the Maison Rouge Mobile."] Chrysalis CH2 1201.

Performance: **Energetic**
Recording: **Variable**

At its best, Jethro Tull's new two-record "live" set, *Bursting Out*, is just what a concert LP should be: a fine, energetic performance of some of the band's best material spanning its decade-long career, representative (as much as is possible without visuals) of a "typical" Tull concert. But at its worst, *Bursting Out* points to many of the things that make people avoid live LPs: inconsistent sound quality, a virtual lack of material that hasn't been heard before (Jackson Browne's pioneering efforts in this direction seem to have had little effect on the world of rock marketing), and worst of all, the obligatory drum solo which everyone who's not a drummer skips over on every live rock LP. There are also some petty annoyances—for instance, the bleeping out of some of Ian Anderson's introductory comments.

The band's playing, for the most part, is remarkably like that on the studio version of the same songs, and in fact, one of the points that most strongly recommends this LP is that while nothing is sacrificed in the quality of sound, these "live" tracks have that extra sense of presence and vitality that the studio versions sometimes lack. A pleasant surprise along these lines is the performance here of "Sweet Dream." Originally released as a single between the *Stand Up* and *Benefit* albums, "Sweet Dream" was a terribly hard-to-find record on this side of the Atlantic until the release of the *Living in the Past* set. Unfortunately, by the time the song made it to that LP, it had undergone an emasculating remix. On *Bursting Out*, "Sweet Dream" is back in all its power and glory, sounding very much like the original 45.

Another high point, albeit a short one, is the new version of "A New Day Yesterday," done here in a bluesy style. That leads into a few minutes of flute and echo chamber antics from Ian Anderson, including a little fugal version of "God Rest Ye Merry Gentlemen" and the Bach "Bouree" from *Stand Up*. For me, Tull's acoustic-based songs stand up (no pun intended) best, and those included here, particularly "Songs from the Wood" with its madrigal opening, show off the inherent musicality of this band to best advantage. The heavy metal songs—"Locomotive Breath," "No Lullaby" and that sort—are less interesting, although the "live sound" of Martin Barre's electric guitar does give them more life here than in their previous incarnations. Barre's playing, in fact, is a constant highlight of *Bursting Out*, his contributions to the band's sound every bit as important as Ian Anderson's.

JETHRO TULL: True but flawed

The low point of *Bursting Out* is "Thick as a Brick." It's not just that the LP-length masterpiece has been reduced here to a 12-minute skeleton tailored to afford various players space to solo and to show off the band's tight ensemble—that doesn't even really bother me. What I find amazing is that whoever prepared these tapes for release seems to have missed a low-level (but annoyingly audible), high-pitched squeal that begins during Martin Barre's guitar solo about six minutes into the track and lasts for around three minutes. Other than that, the sound on these discs varies from excellent (the majority) to rather boxed-in and transistor radio-ish, the latter primarily during some of the more electric moments. The mix is a good one—again, representative of the band's stage set-up—with electric guitar and John Evan's keyboards dominating the right channel, bass guitar and David Palmer's keyboards on the left, with flute, acoustic guitar, vocals and drums in the center. There is also just the right amount of ambient sound which, combined with the great separation in the mix and the generally high level of playing here, makes for an exciting "live" album, despite its flaws.

A.K.

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CIRCLE 89 ON READER SERVICE CARD

FOUR TOPS: ***At The Top.*** [Norman Harris, Ron Tyson, Bruce Gray, producers; Carl Paruolo, Dirk Devlin, engineers; recorded and mixed at Sigma Sound Studios, Philadelphia, Pa.] ABC Records AA 1092.

Performance: **Solid Four Tops**
Recording: **At the Top**

At a time when disco has established itself as more than just a musical fad, it's reassuring to see that there remains a clear distinction between it and what has, for quite some time, been called soul music. The Four Tops remain as much the essence of the Motown sound now, as they were in their prime, a full thirteen years ago.

Subtlety is the key to this Harris Machine production, and, in fact, to the Four Tops sound. It is the subtle manner in which Don Renaldo's "Swinging Strings and Horns" play second fiddle to the Tops' vocals. Now, it's common recording sense that vocals are laid down on top of the instruments, but Mr. Harris takes this one step further. Like a painting on canvas, the strings and horns on "Put it on the News," are the backdrop, while the vocals remain the focal point of the musical picture. It is the capturing of the subtle Four Tops harmony on "When Your Dreams Take Wings and Fly." These are songs with a moderate disco beat, reminiscent of Tavares or Earth, Wind, and Fire. This is wholly understandable from a producer's viewpoint, as an attempt to attract a disco audience, but Harris has not sacrificed the Four Tops sound for his efforts. As a matter of fact, songs like "This House" and "Inside a Brokenhearted Man," will send you reeling back to Four Tops standards like "Seven Rooms of Gloom" and "Without the One You Love." Meanwhile, "Seclusion," a soft, slow dancing piece, is just the sort of thing you'd expect from the 1979 Four Tops.

So why isn't it "At the Top" of the charts? Well, while the album remains an artistic accomplishment, I have a feeling that the lack of conviction of the music to drums, cymbals, and other disco necessities will leave this one "somewhere in the middle."

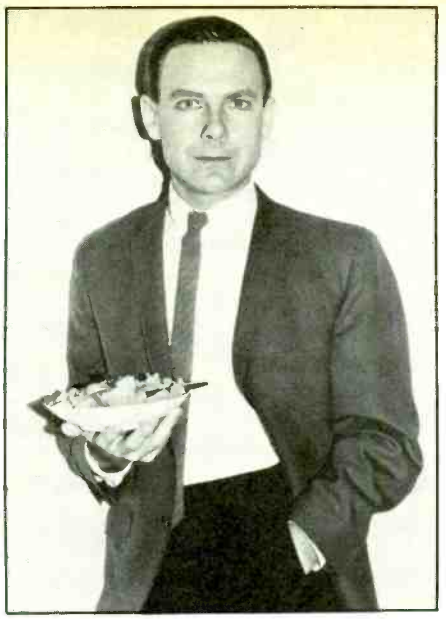
What is clear throughout is that the Four Tops have put together a strong collection of songs on this album. While it may not end up "At the Top" commercially, it is sure to be a favorite of longtime Four Tops fans, or anyone who appreciates soul music for soul music. Not

only is the album well produced and performed, it is evenly paced (another Norman Harris subtlety), and is a real pleasure to listen to again and again. S.C.

ROBERT FRIPP: ***Exposure.*** [Fripp, producer apparently; Fripp, Ed Sprigg, Steve Short, Jim Bonneford, engineers; recorded at Fripp's Mobile in New York, The Hit Factory in New York, Relight Studios in New York, The House of Music in New Jersey, between June 1977 and January 1979.] Polydor PD-1-6201.

Performance: **Fripped out completely**
Recording: **New dimensions in illogic**

"Can I play you some of the new things I've been doing, which I think could be commercial?" So Robert Fripp, he of the King Crimson/Brian Eno experiences, begins this roller coaster approach to modern recording. Electronic effects, cut and paste compositional changes of time and key, uncanny mixtures of technological precision and fay casualness, poetic license, and sheer imagination enter into Fripp's picture, and the result is *Exposure*.



ROBERT FRIPP: Methodical madness

Long a leading proponent of the British avant-garde, Fripp is uncompromising here. "Disengage" is raw futuristic rage in Bowie's *Heroes* style, "You Burn Me Up I'm A Cigarette" is a frenetic punkish rocker, and the instrumental "Breathless" is like latter day Crimson. Weirder still is "NY3," a vicious argument between father, mother and their pregnant daughter to the tune of heavily-affected electro-rock. This mayhem is followed immediately by one of two Joanna Walton vocals, the lovely ode "Mary."

Equally illogical is side two, beginning with the title cut co-authored with Peter Gabriel, formerly of Genesis. Terre Roche (you'd better hear her too with sisters Maggie and Suzzy on *The Roches*, Warner Bros. produced by Fripp and engineered by Sprigg) provides extraordinarily grating vocals on "Exposure," then Fripp cuts to, in this order, a heavy fusion instrumental, strange conversational excerpts, transparent synthesizer imagery, and then an angry "I May Not Have Enough Of Me But I've Had Enough Of You." This madness is answered by a pretty tonal tapestry, a radio-recorded speech about the coming Ice Age, and then Peter Gabriel singing a very sensitive version of his "Here Comes The Flood."

Ther is a method to "this Fripp's" (as he refers to himself) madness. Parts of this project are excerpted from Daryl Hall's solo album *Sacred Songs*, produced by Fripp but not yet available in public; Hall and Peter Hammill are among the

vocalists used herein. Fripp notes that *Exposure* will be the first in a series of discs, to be followed shortly by *Frippertronics* and *Discotronics*. And Fripp has said elsewhere that his "longterm gameplan" is to record extensively in the 1978-81 time period, 1981 climaxing as "The Year of the Fripp." If this record is any indication of what's in store, our ears had better be wide open to anything and everything.R.H

RICHARD WRIGHT: *Wet Dream.* [Richard Wright, producer; John Etchells, engineer; Patrick Jauneaud, assistant engineer; recorded at Super Bear Studios, France, January 10 to February 14, 1978.] Columbia 35559.

Performance: **Boring**
Recording: **Flawless**

As a member of one of the premier forces of space rock, Pink Floyd, Richard Wright is in a peculiar position. A technically over-proficient keyboardist, Wright's contributions to the group's dynamic translations of mood into sound are immeasurable. His contributions as a writer, however, are much more limited, and *Wet Dream* shows why.

Having written and produced *Wet Dream*, Wright is quite fairly the only person to blame for its dazzling failure to excite the minds and ears. Enclosed in the usual subtle/gaudy Hipgnosis package, *Wet Dream* seems so deceptively full of vibrant promise, yet this is fulfilled only in its technical excellence. Side one starts with "Mediterranean C," a pleasantly jazzy cut with an overt air of somnolence. The sax break is bland, but mixed well, and the somewhat livelier guitar break fades away too soon to be appreciated. "Against the Odds" is about as sedated as "Mediterranean C," with keyboard work that is smooth as glass and just as interesting. Wright's casual, softly droning vocals add little but are comfortably inoffensive.

Another jazzy tune, "Cat Cruise," has piano work that is simple and unobtrusive, matched only by the appropriately placed drums for soporific effect. A short guitar break barely pierces the daze. "Summer Elegy" crawls along with tastefully unthrilling vocal harmonies, while "Waves" erodes the listener's consciousness. Outside of their total intrinsic lack of appeal, "Summer Elegy" and "Waves" contain something clearly reminiscent of Pink Floyd.

Side two is just as somnolent. "Holiday" is an almost successful attempt to grab the attention of the listener. Acoustic piano supports the song and Wright's vocals round it out well; it ends with slashing lead guitar. But it's all downhill from here. "Mad Yannis Dance" is more synthesized nonsense. Slow and stuttering, it drags along its painfully crippled way for 3:19 and then weakly segues into "Drop in from the Top," a monotony which resembles a beginner's keyboard finger exercises. The requiem-like "Pink's Song" is poorly planned and purposeless; while "Funky Deux" is a jumbled instrumental that could be from the soundtrack of the type of movie usually televised at 3 a.m.

At its best *Wet Dream* is a real washout. Wright has gone Pink Floyd a fatal step further into mellowness, and demonstrates that he clearly lacks the verve, energy and humor that drive Pink Floyd. M.D.

STRAWBS: *Classic Strawbs.* [Tony Visconti, Dave Cousins, Tom Allom, and Strawbs, producers; engineers and recording locations not given.] A&M Records of Canada SP9800 (double album.)

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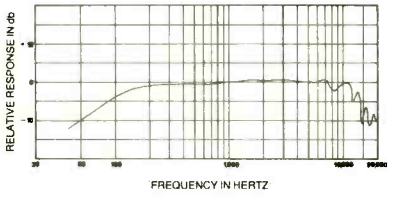

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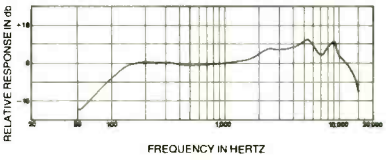
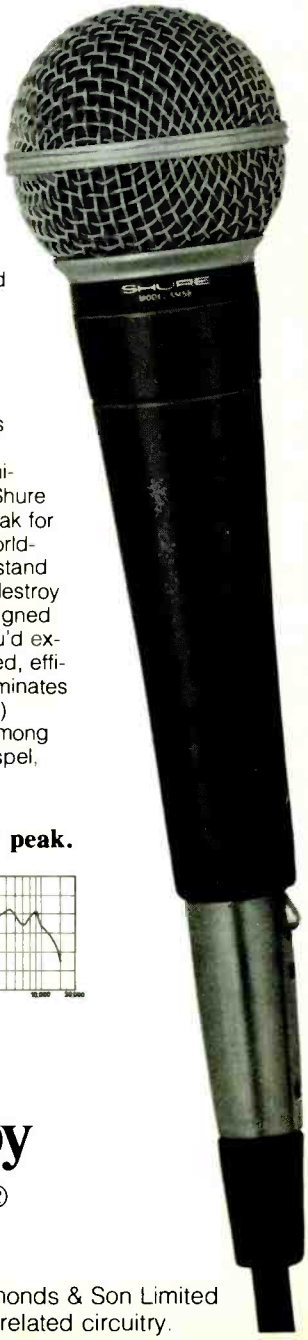
...some like a "presence" peak.





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CIRCLE 118 ON READER SERVICE CARD

Performance: **Historic**
Recording: **From primitive to modern in two easy discs**

For nine years, Dave Cousins has piloted this group to high critical acclaim and moderate commercial success. The Strawbs has always been a musically innovative group, and has acted as a touchstone in the careers of Rick Wakeman, now of Yes, and Richard Hudson and John Ford, who later became Hudson-Ford. *Classic Strawbs* is a chronicle of those first nine years (eight albums) of the group. From an historical point of view, the album is an excellent gauge of the development of the group and its recordings. Its selections range from the early "Where is the Dream of Your Youth," (1970), to the masterful "Benedictus" (1972), and "Hero and Heroine" (1974), to "Hanging in the Gallery" (1977). The only thing more a music historian might ask for is that the cuts be arranged chronologically, so that the album might reach one big high point around the end of side three. The cuts on the album appear to be arranged haphazardly, and the album suffers from a series of musical peaks and valleys.

At one point, "New World," the brilliantly recorded cut with all the experience of producer Tony Visconti's three previous Strawbs albums behind it, is followed by the aforementioned (and empty sounding) "Where is the Dream of Your Youth," an early tune recorded with the realtively poor "live"

STRAWBS: Peaks and valleys

recording facilities of early 1970. A dreadful letdown.

"Queen of Dreams" is another one of those historic cuts that really doesn't display the ability of the group. Its instrumentation is recorded backwards, a la "Rain" by the Beatles.

In the meantime, my question is where are the real Strawbs classics, like "Part of the Union," "Heavy Disguise," and "Where Do You Go (When You Need a Hole to Crawl In)" that all weigh so heavily in the acceptance of the group, and truly reflect the artistry of the recordings *Grave New World*, *Bursting at the Seams*, and *Nomadness*, respectively? I've looked again and again, and they are not to be found on these four sides of vinyl.

For the avid Strawbs lover, *Classic Strawbs* is a must for the historic documentation of their music, but then, you already have the albums. But for the person looking for good, solid Strawbs music stick with *The Best of Strawbs* (A&M SP6005) the American release. It contains twelve songs not on *Classic Strawbs*, and it's the best. S.C.

THE BAND: *Anthology.* [The Band, producers; John Simon, co-producer on some cuts; material drawn from earlier releases by the Band, 1968-1977.] Capitol SKBO 11856.

Performance: **The best of an already good thing**
Recording: **Ditto**

Few American rock bands have been as American-sounding as the Band, and this double album of twenty tracks is one of the richest treasures of the index of contemporary music. The blend of mountain, folk, Southern and urban rhythm-and-blues, rock and other American musical styles rarely has been realized as well as by this sextet.

Most well-stocked record collections already have the eight albums from which this material has been drawn. But if the records are starting to sound ragged, this would be a good replacement. Because of the care taken during the recording of material during the past 10 years, the tracks included here are clear and bright.

The dominant sound of these songs is of an America long past, in which carnivals and band concerts were big

things and people told stories in song, and the very best of them comes from the immensely talented pen of Robbie Robertson. Some of the music is quaint, almost antique, such as "Dixie" or "Rag Mama Rag" or "Up on Cripple Creek." Sometimes the group lets out all the stops and rocks, such as on "Chest Fever," which has an opening that sounds as if it might have been fashioned by Steppenwolf. The song itself includes some "wheezing" horn passages, though, that sound as if they are part of the faded memory of a band shell concert in a park.

The instrumental strengths of the group can be heard on such songs as "Stage Fright," "The Shape I'm In" and "Life is a Carnival." For the most part, the arrangements are produced entirely by the group members themselves, but on "Carnival," for example, some brash horns are prominently displayed and give the song a gritty, urban feel.

One of the curios among the songs here is "When I Paint My Masterpiece," a rare Dylan-Robertson collaboration that combines the strengths of both into a riveting piece. The accordion embellishment recalls the carnival, but soon the song switches to a guitar-led sound, and the sense of the song now is one combining the old world and the new into what sounds like a Euro-American blend of music.

The Band occasionally borrowed from other sources and gave that material a distinctive stamp—examples are "The Great Pretender" and "Mystery Train." The latter especially shows dazzling inventiveness, with a rhythm that combines rock and trains, and an organ passage that recreates the Doppler effect of the sound of a train passing in front of the listener.

The album cuts are arranged chronologically, although "This Wheel's on Fire" first came on *Music From Big Pink* before it appeared on the concert recording, *Rock of Ages*, the source for the cut given here.

In an album filled with pluses, by the way, one should not overlook Robert Palmer's splendid liner notes—four pages of interesting history on each of the twenty tracks on the two discs. S.R.

EMERSON, LAKE & PALMER: *Love Beach.* [Emerson, Lake & Palmer, producers; Karl Pitterson and Jack Nuber, engineers; recorded at Compass Point Studio, Nassau, Bahamas.] Atlantic SD 19211.

Performance: **Confident, sometimes smug**
Recording: **Very good**

Emerson, Lake and Palmer were very wise to avoid a repeat performance of their 1977 magnum opus, *Works*, when they went into the studios for a new release. We have only half an opus here, but the other half of this record is blatantly pop, and some of it is unnecessarily vulgar. The "half-opus" is entitled "Memoirs of an Officer and a Gentleman" and calls forth many of the musical techniques for which ELP have become famous. The piece is melodic and employs piano and synthesizer to good effect. The lyrics are generally literate and well sung by Greg Lake.

The four songs in "Memoirs" form a suite about England and an Englishman in the waning pre-World War I days of the Empire. Nobility is mixed with duty, honor and country in actually quite a pleasant musical setting. Some of the lyrics may seem a bit strained, but the overall effect is quite nice, thank you.

The group's fascination with classical music is evident in some of the instrumental breaks, bridges and lead-

ins. The piano chords played slowly to begin the piece could be from Liszt; the introduction to "Love at First Sight" could be from Beethoven or Chopin, and there is a long, classically-inspired acoustic guitar bridge leading to a melody that sounds as if it is played on the glockenspiel.

"Letters from the Front" is uptempo, and its long instrumental opening once again demonstrates Keith Emerson's total command over and proficiency at the synthesizer, and his ability to synthesize different musical sounds for music's sake and not for sound's sake. The vocal begins in one octave and ends in an octave lower, and Lake's voice at the lower register sounds something like a metallic imitation of his usual tone and timbre.

The suite closes with a march, "Honourable Company," and it is something of a theme and variations, with each variant slightly different from the previous in embellishment, key or both. The piece picks up in intensity gradually so that by the time it closes it resembles Jethro Tull's tongue-in-cheek "Dam Busters" march that closed the new Tull "live" album, *Bursting Out.*

The "A" side of the album is something else entirely—six separate songs, primarily by Lake and Peter Sinfield, former lyricist for King Crimson, and including one patented "lip-service" classical adaption, this time the "Canario" by Rodrigo. Sinfield is the lyricist for the entire album, it seems, and while his work in "Memoirs" is not bad, some of the lyrics on the "A" side are terrible.

The title track is somewhat tuneless and is done with a sense of urgency, almost conveying the same feeling as some of the New Wave's material. "All I Want" features nice synthesizer counterpoint to the melody in the vocal line but is still pretty pretentious stuff. "The Gambler" is a pop blues piece with a sparse arrangement; "For You" opens with a long keyboard passage in minor key and contains considerable sense of the self-important. "Canario" is an instrumental, played in a very quick tempo and not unlike the ELP version of Copland's "Rodeo."

One who has followed Emerson, Lake and Palmer with interest over the past years has been able to appreciate their musical growth and experimentation, that culminated with the two volumes of "Works." Flawed as they were, the two 1977 releases still represented a serious approach to contemporary music. "Love Beach" has a split personality; half the record pushes commercial pop at the listener, and the other half draws the listener into more intelligent music. I prefer the latter.

S.R.

LEVON HELM: ***Levon Helm.*** [Donald "Duck" Dunn, producer; Barry Rudolph, Bruce Robb, Steve Melton, Gregg Hamm, engineers; recorded at Cherokee Studios, Hollywood, Ca., and Muscle Shoals Sound Studios, Sheffield, Ala.] ABC AA-1089.

Performance: **Enigmatic**
Recording: **Uninspired**

Levon Helm is something of an enigma. The only original member of Ronnie Hawkins back-up group, The Hawks, who remained when that group evolved into the Band, Helm has had a long and multifarious career. A talent of unquestionable ability, he was at one point the dominant force in the Band when they were known as Levon and the Hawks. He separated from them, however, when they went with Dylan on his 1965-66 world tour, only to rejoin them soon afterward to work on their

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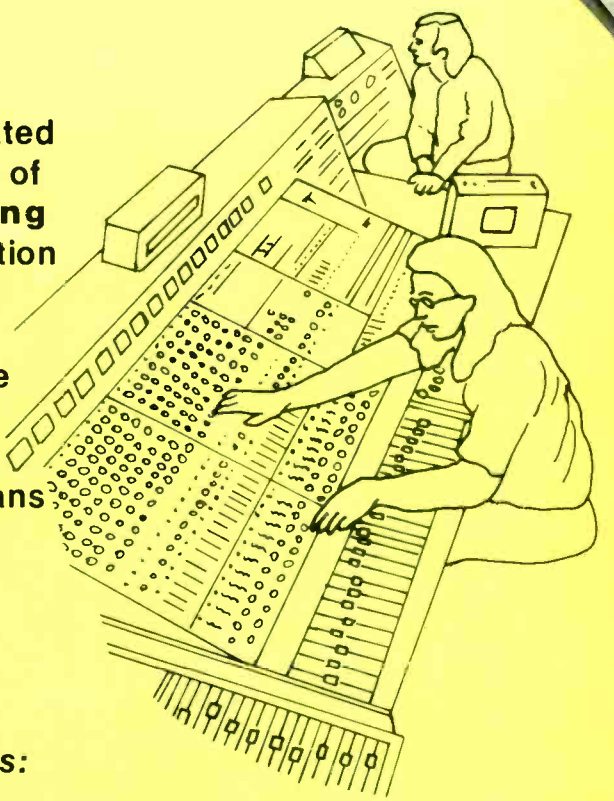

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first album.

Helm's history allows him to display a great deal of versatility on this album. "Ain't No Way to Forget You," an upbeat Quillen-Smith composition sets a pace which most of the album unfortunately fails to keep up with, but it exhibits the same style of production that is used throughout the album: an uninspired standard mix, with a noticeably too-heavy emphasis on the drums, and vocals that are, for the most par, unadulterated and on top where they can be heard. "Ain't No Way to Forget You" has solid, upfront guitarwork that sets it apart from the rest of the work on the album.

A thin sound and a poor arrangement make "Driving At Night" resemble an anemic jam; it's jam session bluesy without any of that jam session energy. The brass cuts in and out abruptly, giving the impression that there was quite a problem either with dropout or the console wiring. "Play Something Sweet" is pretty much the same as the preceding cut but sports a finer, more polished sound.

Pounded into submission by a domineering rhythm section, "Sweet Johanna," a J. and J. Hall leftover, is an exercise in tedium. Easily mistaken for a lullabye, "I Came Here to Party" is mellow and unimaginative. Helm drones on, not benefiting from the rhythm-biased engineering.

Side two starts out as a treat with the Al Green-Mabon Hedges tune "Take Me to the River," far and away the best cut on the album. For once the overpowering drum and bass work with the song instead of against it. Everything else falls into place also; the guitar is funky and energetic, the brass well-placed and vibrant.

"Standing on a Mountaintop" is drawn out like the endless haze of the mountains, while "Let's Do It In Slow Motion" is a slow version of the preceding cut. "Let's Do It In Slow Motion" does have some interesting vocals, though this doesn't make up for the rest of its failings. Helm sums it all up with the last cut, "Audience For My Pain," in which he explains what listening to himself is usually all about.

Even if you could hear more than just the solid percussion work, *Levon Helm* still wouldn't be a great album. If Helm wrote some of his own material, instead of using poor judgment in choosing the material of others, he would have a better chance. (A different producer wouldn't hurt, either.) As it is, he might as well be just another one of the boys in the band. M.D.

JAZZ

LENNIE TRISTANO: *Descent Into The Maelstrom.* [Lennie Tristano, producer; Lennie Tristano and Rudy Van Gelder, engineers; recorded in 1952, 53, 61, 65 and 66 at various unnamed locations, possibly Lennie's basement.] Inner City IC 6002.

Performance: **Beyond reason**
Recording: **Crude**

According to Andrew Sussman at Inner City Records, *Descent Into The Maelstrom* "was meant to signal Lennie Tristano's return to the scene . . . to be the first of many LPs which would be readily accessible to the public and his

many fans." Unfortunately, the highly esteemed pianist died this past winter and a long overdue comeback was cut tragically short. A January Memorial Concert saw jazz greats like Max Roach, Roy Eldridge, and Eddie Gomez pay tribute to a man who helped keep jazz on its toes during some pretty lean, transitional years.

Although *Descent Into The Maelstrom* was recorded at various times between 1952 and 1966, it's a real eye-opener as to where Lennie's head was at in the period between bebop and free jazz. Respected as an ambitious exponent of pre-cool post-bop, a reputation solidly upheld on trio cuts like "Stretch" and "Ju-Ju," Tristano shows another side of himself on these obscure recordings. Most obvious is his predilection for unaccompanied solo piano explorations (long before this practice became vogue) wherein Tristano utilizes a maze of influences from blues to bop and balladry.

A couple of 1965 tunes, "Dream: Paris 1965" and "Image: Paris 1965," recorded in concert, range freely from popular song quotations to abstract chordings and open-minded improvisation. Cuts four through six on side one, untitled rehearsals from a '61 recording date, are lighter solo jobs, almost mainstream. But if the "live" Paris cuts are darker, then "Descent Into The Maelstrom," which opens the album, is totally unbelievable. Inspired by Edgar Allan Poe's story, the piece becomes a mad swirl of dense, foreboding clusters not unlike Cecil Taylor's exhibitions. This cut, incidentally, was engineered by Tristano himself in 1953, and it sounds absolutely abysmal—as do the Paris sessions. Nonetheless, these monaural tracks are noteworthy for the unusual music they contain.

Side two is full of healthy trio tunes, "Pastime" and "Ju-Ju" engineered by Rudy Van Gelder in 1952 with Roy Haynes on drums and Peter Ind on bass—they're short, sweet excursions into balladry and cool intellectualism. "Stretch" and "Con Con" were taped by Tristano in '66, and he had apparently gotten his heads cleaned out by this time. Six and eight minutes long respectively, these two pieces show Tristano in a groove more familiar to those who knew him for experiments in keyboard rationalism. Tristano's piano style was not totally Cool, nor exactly Bop—it was a distinctively original conception grounded in the Tradition, but angling its way toward atonal adven-

the new jazz generation: two ways of making it

By Nat Hentoff

The first time I heard trumpeter Warren Vaché a few years ago, it was as if Bobby Hackett had willed him his sound and phrasing. Then I heard Louis Armstrong in him, some Bix Beiderbecke, and even a touch of Clifford Brown, which is as "modern" as Vaché gets. By the second set, I realized that this silvery young player was really not an eclectic but had actually fused all those lyrical spirits into his own way of speaking with uncommon grace on the horn.

Vaché has continued to shape and deepen his conception, and *Jillian* (Concord Jazz) is his most thoroughly satisfying set so far. Few other trumpeters in jazz can play a ballad in as glowingly direct a style as Vaché. No superfluous notes, an utterly unerring flow of line and time, and a tone of such warmth and fullness as most hornmen can only dream of. On medium and up tempo numbers, Vaché is exuberant, sometimes biting, and always swinging. Effortlessly swinging.

His backing in this album is marvelously unobtrusive but enliveningly felt—pianist Nat Pierce, bassist Phil Flanigan, guitarist Cal Collins, drummer Jake Hanna, and on some numbers, alto saxophonist Marshall Royal. As is the custom on Concord sessions, the recording standards are among the very best in jazz: warm, vivid, but not overdramatized sound and just about perfect balancing among the instrumental voices.

By contrast with mainstreamer Vaché, tenor saxophonist Bob Berg, also of the new jazz generation, is very much in the post-bird groove. He's worked with Horace Silver and Cedar Walton, and has become much involved with Latin music. Berg plays with a walloping beat; blues-laced, often shouting tone; and above all, with an exhilarating openness of emotion. He is a consistently exciting improviser because—and in this respect, Berg resembles John Coltrane—he always seems to have so much to say so *urgently.*

His *New Birth,* then, signals a vital, rising presence. There isn't a Berg solo that doesn't command and sustain attention and, by the way, that "cry of jazz"—the human sound that has always characterized the most durable players—is very much a part of his way of sounding.

The crisp, resilient rhythm section consists of pianist Cedar Walton, bassist Mike Richmond, drummer Al Foster, and—a flavorful addition, Sam Figueroa on congas. The other horn is trumpeter-flugelhornist Tom Harrell, and he too is surely going to become one of the pre-eminent jazz soloists. An alumnus of units headed by Woody Herman and Horace Silver, and currently co-directing a big band with Sam Jones, Harrell has a brilliant tone, incisive ideas, unflagging swing and—like Bob Berg—an awful lot of "soul."

Xanadu's engineering here is clean, spacious, and finely attentive to what's going on. All in all, with Warren Vaché and Bob Berg—though their idioms are quite different—the jazz continuum keeps being enthusiastically nurtured.

WARREN VACHÉ: *Jillian.* [Carl E. Jefferson, producer; Phil Edwards, engineer.] Concord Jazz CJ-87.

BOB BERG: *New Birth.* [Don Schlitten, producer; Paul Goodman, engineer.] XANADU 159.

tures in New Music. *Descent Into The Maelstrom* is extremely limited soundwise, and some of the performances won't stand infinitesimal scrutiny. But the title cut may represent one of Lennie Tristano's undocumented destinations, and the other sides help fill in some of the missing links on a musician too long ignored. R.H.

GILBERTO GIL: *Nightingale.* [Sergio Mendes, producer; Geoff Gillette, engineer; recorded at Kendun Recorders, Burbank, Ca., Fall 1978.] Elektra 6E-167.

Performance: **Rock 'n' Rio**
Recording: **Bright 'n' Breezy**

Brazilian musicians have had a profound impact on North American jazz for two decades now. In the sixties it was bossa nova and samba with Joao & Astrud Gilberto and Antonio Carlos Jobim. In the seventies it has been Airto Moreira, Flora Purim, and a host of percussionists taking the lid off of thoses unbelievable Third World rhythms. They've created a whole new range of tonal colors, ebullient melodies, and pan-cultural references.

While the Brazilian Connection has been linked most frequently to jazz (this album's producer Sergio Mendes being an MOR exception), it's beginning to look like the eighties will see rock and other contemporary vocal musics influenced by Brazil. Milton Nascimento has already had some effect on the likes of Cat Stevens, Michael Franks, and Earth Wind & Fire, and Jorge Ben is due to make his first northward moves. This U.S. debut by Gilberto Gil, however, offers concrete proof that at least one "new wave" may originate near Copacabana Beach.

Gil was once a politically censured poet in his native Bahia, but *Nightingale* is far from controversial. Singing in Portuguese and English, Gil is upbeat and joyful on fine cuts like "Maracatu Atomico," "Balafon," and "Samba De Los Angeles." A simmering gang of percussionists (Alex Acuna, Laudir de Oliviera, Roberto da Silva, etc.) incite such common session participants as Don Grusin, Lee Ritenour, and Abraham Laboriel. Gil's reggae on side one, "Goodbye My Girl," is deadly contagious and, like several songs here, sucks the listener into an inescapable revolving door of bright melody and breezy rhythm.

GILBERTO GIL: New wave from Rio

Even more than Milton Nascimento's excellent new *Journey To Dawn* (A&M SP-4719), *Nightingale* is startlingly "Americanized" by funky beats, slickly modern production, and a pop-soul chorus. That Gil numbers James Brown and Stevie Wonder amongst his influences is obvious from the party soul atmosphere of "Alapala" or a conventional-type ballad "Here And Now." The title cut itself is astonishingly lightweight and almost vaudevillian, a non-Brazil novelty item that serves as a comic breather.

Sergio Mendes and Geoff Gillette create a clean, commercial tape but stay out of the way on such strong material as "Ella" and the heavy, electronic ballad "Move Along With Me." Gilberto Gil hits enough high scat notes to send shivers through jazz fans, and he opens up the door to a whole new pop-rock audience as well. *Nightingale* contains the kind of positive, rhthmic, celebrant sounds that have an irresistably universal appeal. R.H.

BENNY GOODMAN: *The King Direct To Disc.* [Benny Goodman and Glen Glancy, producers; Jay Ranellucci, Bill Stone, Ken Perry, and Eugene Thompson, engineers; recorded June 24, 1978 at Capitol Records, Hollywood, Ca.] Century Records CRDD 1150.

Performance: **Goodman at his best**
Recording: **Quiet, undistorted, direct-to-disc**

Benny Goodman's first recordings were made at the home of a friend, Earl Baker, in 1926 on an Edison cylinder machine which could make records as well as play them back. These records are to be reissued shortly by Jazz Archives. Benny's most recent recording, at least the most recent that I've

heard, was made by the direct-to-disc system and the sonic advantages should be obvious to even the most casual listener. In addition to Earl Baker on trumpet, Benny on clarinet and an unknown tenor sax and rhythm section, the cylinders also include an early recorded example of Glenn Miller's trombone playing. Today Benny is able to command whoever he desires to record with simply because he *is* the King of Swing. I don't always agree with his choices but this album finds him in the fine company of players like Major Holley on bass, Cal Collins on guitar and Buddy Tate on tenor sax. I would argue with some of his other selections (like Merv Griffin's comic sidekick Jack Sheldon over any of a dozen other trumpet men I would have found preferable) but that's Benny's business and he pretty much works with who ever he likes. As far as Benny's playing goes, it's not a surprising record. If he hasn't recorded "Here's That Rainy Day" and "Alone Together" previously, they're the only strangers out of the nine tunes on the album. All the numbers fit Benny's style like the proverbial comfortable old shoe. If I have to pick one favorite it would be "Oh Lady Be Good" which includes excellent solo work from Goodman, Collins and Holley.

If Century Records keep turning out quiet undistorted surfaces like this I'm going to start believing that direct-to-disc is worth the increased price tag. The surprise of the record is that Benny Goodman, at only a year short of his seventieth birthday, can still play like a man possessed by the youthful enthusiasm he had some forty years ago. J.K.

VOCAL JAZZ INCORPORATED: *High Clouds.* [Ettore Stratta, producer; Jeffrey Kaufman, executive producer; Jim Crotty, engineer; recorded at RCA Studios, New York, N.Y.] Grapevine GNR 3310.

Performance: **Jazz chorale**
Recording: **Clean, understandable, bass booms a bit sometimes**

Actually there are few combinations of instruments and voices that haven't been tried somewhere before. The idea of a jazz chorus is as old as The Swingle Singers or The Double Six of Paris. And, why not? Louis Armstrong and Ella Fitzgerald have been using their voices as instruments for years and

nobody seems to fret much about it. So why not a jazz chorus? That's obviously a question that Ira Shankman, music director and Dennis Douglas, assistant conductor and Jere Hanson, executive director asked when they got together and formed Vocal Jazz Inc., a group of ten singers who were more used to doing "oohs" and "aaahs" in back of pop/rock and country singers or (heaven forbid) commercials. So why shouldn't they, in their off hours, get together and sing ballads like Kurt Weill's "My Ship" and jazz charts like Willie Maiden's "A Little Minor Booze?"

It works because they're all fine singers. You have to be to do those studio session jobs. It works because Ira Shankman, for years Eddie Bonnemere's associate conductor for Eddie's Jazz Masses at Saint Peter's Lutheran Church, knows a jazz chorus and how it works. It works because the arrangements are by such fine vocal arrangers as Gene Puerling, the guiding force behind the Hi Los if you remember back that far.

It would work better if there were more varying textures than there are on this LP. The Double Six discovered this years ago and asked Dizzy Gillespie to sit in with them on some of their records. A horn would have helped to relieve the feeling of the sameness of sound that one gets listening to this LP from beginning to end. There are brief patches of piano by John Scully and guitar by Carmine D'Amico, fine players both but not individual enough to do for Vocal Jazz Inc. what Dizzy Gillespie did for the Double Six.

Actually the best way to hear this LP is one cut at a time interspersed with non-vocal renditions, perhaps of the same tunes for contrast. Yet there's no denying the ingenuity of Lou Busch's arrangement of "A Foggy Day" or the excitement of Jane Blackstone's scatting on Willie Maiden's "A Little Minor Booze."

When dealing with a vocal recording the main thing the engineer has to give his first attention to is seeing that the words get on the disc, comprehensibly. Jim Crotty does that part of the job very well. Sometimes it seems to me that the instrumental balance is a bit heavy on the bass but that may just be personal preference.

All in all it's a fine record and the only reservation I have is with regard to the unyielding similarity of the nine selections of vocal jazz. J.K.

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Every one of Technics four open reel decks has one thing in common: The performance of Technics isolated-loop tape transport system. And that means performance that's comparable to professional open reel decks costing thousands of dollars more.

By isolating the tape from external influences, our isolated-loop tape transport system minimizes tape tension to a constant 80 grams. This not only provides extremely stable tape transport and low head wear, it also reduces modulation noise and wow and flutter to the point where they're detectable on only sophisticated testing equipment.

Electronically, our line of isolated-loop tape decks are equally impressive. The reasons are as simple as their IC full-logic transport controls, highly accurate microphone amplifiers, FET mixing amplifiers and separate 3-position bias/EQ selectors.

And you'll get all this technology whether you choose the two-track RS-1500, the extended playing time of the 4-track RS-1506 (shown above), the convenience of the 4-track RS-1700 with auto-reverse or the studio features of the RS-1520.

There's also an optional full-feature infrared wireless remote control (RP-070). With it you can get your hands on all this sophistication from up to 20 feet.

All four decks hit the competition right between the reels. Because all four have: FREQ. RESP.: 30-30,000 Hz, ±3 dB (—10 dB rec. level) at 15 ips. WOW & FLUTTER: 0.018% WRMS at 15 ips. S/N RATIO: 57 dB (1506 & 1700) and 60 dB (1500 & 1520) NAB weighted at 15 ips. SEPARATION: Better than 50 dB. START-UP TIME: 0.7 sec. SPEED DEVIATION: ±0.1% with 1.0 or 1.5 mil tape at 15 ips. SPEED FLUCTUATION: 0.05% with 1.0 or 1.5 mil tape at 15 ips. PITCH CONTROL: ±6%.

Technics open reel decks. A rare combination of audio technology. A rare standard of audio excellence.

Cabinetry is simulated woodgrain.

Technics *Professional Series*

CIRCLE 98 ON READER SERVICE CARD