

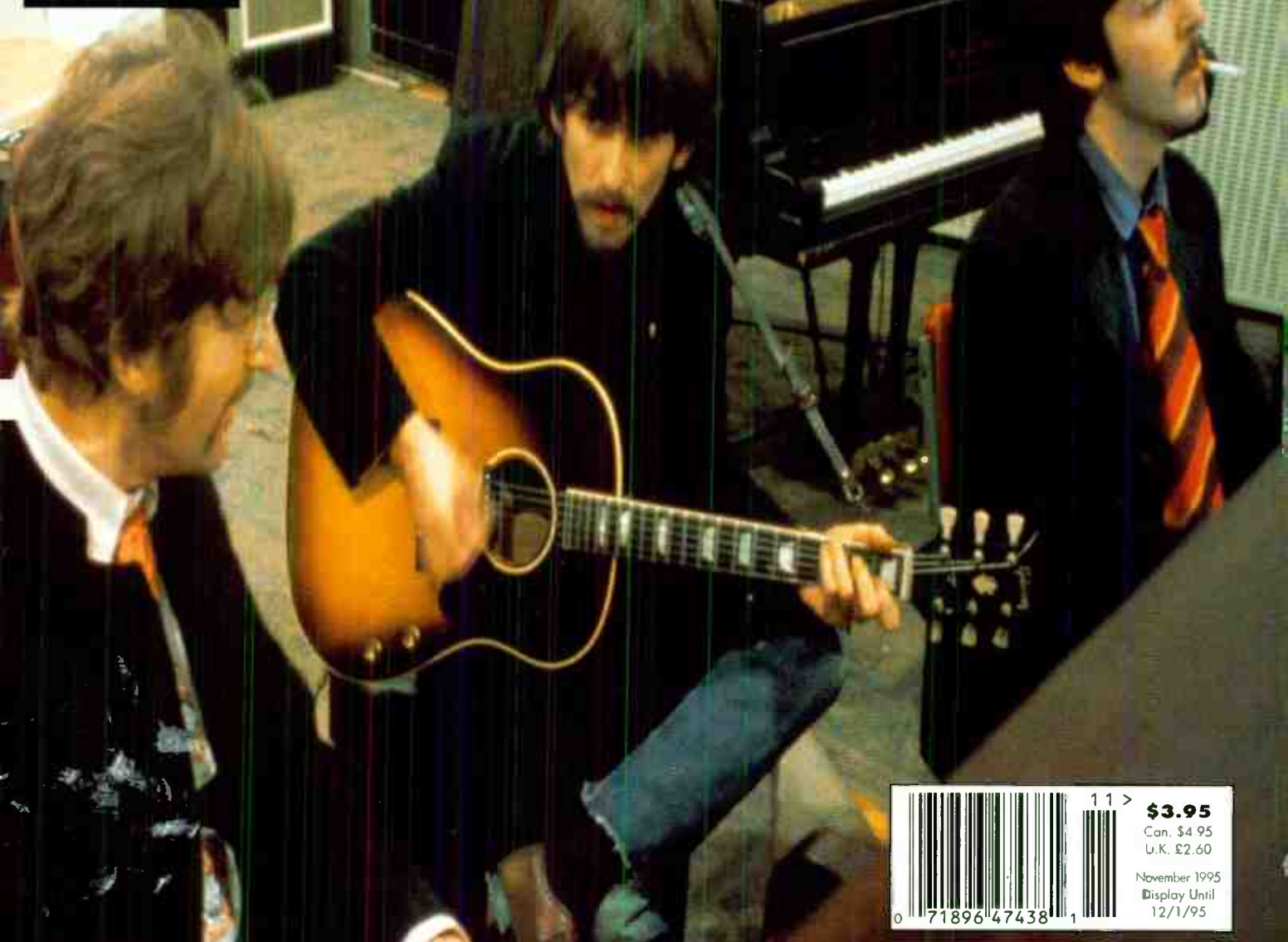
EQ LIVE: BIGGER AND BETTER

EQ

THE PROJECT
RECORDING
& SOUND
MAGAZINE

NOVEMBER 1995

PRODUCT REVIEWS:
FENDER POWERED MIXER
FURMAN CROSSOVER
SOUNDCRAFT CONSOLE
DRAWMER NOISE GATE
DBX REVERB



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BEATLES
BACK TO ABBEY ROAD

World Radio History

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and Smart

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CIRCLE 03 ON FREE INFO CARD

World Radio History

EQ



PROJECT RECORDING
& SOUND TECHNIQUES
VOLUME 6, ISSUE 11
NOVEMBER 1995



FEATURES

- THE BEATLES: YESTERDAY AND TODAY (AND TOMORROW)** *By Patrick Stapley*.....58
It's been more than 25 years since the Beatles last recorded at Abbey Road Studios, but the surviving members took along tapes of their missing bandmate and recorded the first new Beatles songs in more than two decades. Go behind the board with Paul McCartney, Ringo Starr, George Martin, and Geoff Emerick as they discuss this historic session.
- THE 1995 EQ BLUE RIBBON AWARDS**72
Now that AES is a fond memory, it's time to take an objective look and see what we've learned. We pick our annual "Best in Show" products and tells of their impact on the entire audio industry. Plus: What the AES revealed about trends in DAWs, live sound, storage, and project studios.

EQ LIVE

- ELVIS LIVES: LEGENDS OF ROCK ON STAGE** *By Liana Jonas*94
- APC STUDIOS: AS EASY AS APC** *By Liana Jonas*90
- CBGB'S UPGRADE: A CHANGING OF THE GUARD** *By Robert Granger*96
- NEW GEAR FOR YOUR NEXT GIG**102
- ROAD TEST: FENDER PX-22T6D POWERED MIXER** *By Wade McGregor*104
- ROAD TEST: FURMAN X-324B ACTIVE CROSSOVER** *By Wade McGregor*108

TECHNIQUES / WORKSHOPS

- PROJECT BUDGETING: MONEY FOR SOMETHING** *By Bennet Spielvogel*52

COLUMNS / DEPARTMENTS

- MI INSIDER: I THINK I HEAR VOICES...** *By Craig Anderton*.....46
- MAINTENANCE: BALANCED OR UNBALANCED** *By Eddie Ciletti*.....132
- FAST FORWARD: WINDOWS95 = MACINTOSH87?** *By Martin Polon*.....138
- ACROSS THE BOARD: THE WORLD'S SHORTEST TOUR** *By Roger Nichols*.....154
- EDITORIAL**6
- LETTERS TO EQ**8
- EQ&A**12
- ROOM WITH A VU: ROCK 'N' ROLL HALL OF FAME**30
- MICROPHILE: NEUMANN U67/BOBBY DARIN**34
- FIRST LOOK: PEAVEY PS 2482 CONSOLE**38
- EQ TRACKS: LENNY BRAVITZ "ROCK 'N' ROLL IS DEAD"**40
- IN REVIEW: SOUNDCRAFT K1 CONSOLE**112
- IN REVIEW: DBX 290 REVERB**116
- IN REVIEW: DRAWMER DS201B NOISE GATE**120
- REVIEW SHORT: SYNCLAVIER S/LINK**122
- EQ AUDITION: SENNHEISER HDC 451 HEADPHONE**124
- EQ AUDITION: OKTAVA MK219 MIC**126
- AD INDEX**131

ON THE COVER:
The Beatles during the recording of Sgt. Pepper (1967). © Apple Corps Ltd.

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November 1995

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LETTER FROM THE EDITOR

Project Studio Sound

What's another magazine doing on this page? Are we out of our minds promoting somebody else's rag? Well, yes and no. Here's what's going on...

With this issue, the staff of *EQ* magazine is proud to announce an international editorial agreement with *Studio Sound* in England. Anyone who was lucky enough to have spotted a copy of *Studio Sound* on the floor of AES saw that this venerable and much-revered magazine has undergone a modern and refreshing facelift.

What does this editorial agreement mean to you — *EQ*'s readers? It means that the combined editorial clout of our two magazines will provide you with the world's First Looks, first reviews, and finest articles. Together we will be able to bring you exclusive tests of cutting-edge new products — before anyone else.

The result of this agreement are just now finding their way into print. Our exclusive Shaq article appeared in *Studio Sound*'s AES show issue. Their Beatles exclusive proudly graces this month's cover — with newsmaking interviews with Paul McCartney, Ringo Starr, George Martin, and Geoff Emerick. Look for several worldwide *EQ/Studio Sound* exclusive product reviews in the months ahead. You won't find them anywhere else.

As the magazine that first identified and defined the project recording marketplace, *EQ* is excited to be rubbing shoulders with the editors of *Studio Sound*. But don't worry — we know where we come from (the project studio), and we're not selling out to the platinum scene.

Let everyone else go gaga over the Sony Oxford console (\$800,000). Sure it's cool, but the Yamaha 02R (\$8500) is much more *EQ*.



Martin Porter
Executive Editor

WHY BUY THREE RACK UNITS WHEN ONE WILL DO?



If you're not already considering buying a 410, you probably have an unlimited budget or roadies that are weightlifters. However, if you live in the real world you probably have a budget like the rest of us. The DOD 410 Series II packs the features of a graphic equalizer, a notch filter and a compressor/limiter into one box. It's affordable and convenient. Think about it... perfect monitor mixes every night with no feedback *plus* peaker protection, all from the same compact, one-rack spaced box.

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CIRCLE 22 ON FREE INFO CARD

World Radio History

COPY PROTECT THIS!

Re: Roger Nichols's "Across the Board" column in the September issue.

Roger had problems when he upgraded his Mac IIci with a Daystar Turbo 601 Accelerator card, resulting in conflicts with copy-protection installs for his Digidesign applications. Here are some points of interest to your readers:

1. Digidesign does not qualify our systems to run *any* accelerator cards. We attempt to support as many computer configurations as possible to allow maximum choice for our customers when purchasing systems. Testing each and every CPU and software configuration involves a tremendous amount of effort. Unfortunately, we have to draw the line somewhere. Accelerator cards add a tremendous amount of variability to a system, so we don't support them. We want to ensure that systems that we *do* qualify work dependently and consistently. Some users may wish to ignore this and purchase an accelerator anyway, but in that case, *caveat emptor* (buyer beware) is the rule.

2. Even though Roger is using an "unqualified" piece of hardware, when he (and his Miami friend) called about their problems, our Customer Support and Testing departments went to work to find out the cause. The problem was traced to problems between our copy protection and the Daystar card. Digidesign and Daystar are currently attempting to rectify the problem.

3. Copy protection is a necessary inconvenience for our industry. Roger suggests that the use of "dongles" would solve the problem he has had with hard-disk authorization schemes. Unfortunately, "dongles" are not without their faults, which include occasional problems with nonrecognition, sluggish mouse performance, etc. Digidesign will continue to evaluate any and all alternative schemes for copy protection. The last thing we want is to inconvenience our customers.

Dave Lebolt

Director, Professional Product Strategy
Digidesign

ROLAND REBUTTAL

I am writing in response to the review of the Roland DM-800 DAW in the August issue. I am a sound designer/music producer based in Manhattan, and have been a user of the Roland DM Series disk recorders almost since their introduction (first

the DM-80, and now the DM-800). After reading the review, I thought that — while it thoroughly covered many specific points — it "missed the jelly" in regards to the DM-800.

The DM-800 is a monster of a box — both in sound quality and in ability. It has empowered me to reinvent the way I create and produce for film, video, and records.

For me, the key to working and actually making money in an intensely competitive east coast market is to be extremely efficient. I need to maximize the speed, the accuracy, and the "bang" I deliver for each hour of my studio's time. I also have to deliver creatively and sonically, while being fast and diverse.

Because of this, my DM-800 has become vital to me. I have used it on radio spots, TV spots, records, and feature films. It has served as a multitrack, as a digital component in my MIDI studio — even on location for recording sound effects. I've even created spots in a hotel room minutes before meeting with the client to include changes we made on the phone minutes before.

The DM-800 has proven itself to be extremely easy to use. It integrates well into studio environments, where the ability to work fast and in rhythm with the session is crucial.

Feature-wise, I found the combination of audition/scrub, preview, and the waveform display to be super fast and accurate. Very often I just throw a marker down on the fly while still working with my other hand. Then I'll throw the DM-800 into scrub, listen (at pitch) to the edit (which actually makes it easier to nail precise edits — especially in vocal consonants). I press one button to visually check the wave and then hit execute — all the while never really stopping the flow of what I'm doing. By the time that most people would be starting this edit, I'm already done.

In summation, the DM-800 is a dream for vocal comping and sound effects editing. Its sound is pristine. I found it faster and easier to get the precise and detailed edits I needed than with other systems. Most importantly, though, it has allowed me to spend more time being creative because I have a tool that travels with me and that can do a surprising amount of work right out of my project studio — thus saving expensive studio time.

Scott Pittinsky
Compound Sound
New York, NY

ADAT HEAL THYSELF!

Re: EQ's article, "ADAT in the Trenches" in the October '95 issue.

The article by Bennett Spielvogel is well written and should prove beneficial to our customers, but the one small problem is in Bennett's second paragraph, check out *Jammin'*. In this paragraph it is implied that if a tape is down in the transport all you can do is cross your fingers. The ADAT is not some mindless tape-eating shark, mind you!

There is a power-up ADAT sequence that will actually eject the tape for you. This test was not made specifically with this feature in mind, but it does serve the purpose. Here's what you do:

Turn the machine off. Wait a couple of seconds and then power up the unit while holding down Record Enable buttons 1 and 7. The display will now read "CAP," telling you that you're in Capstan Test Mode. At this point, you press Auto Play, which will begin the test and eject the tape. It would be best to prepare for the tape to be unraveled. Take off the top panel and unthread the tape carefully, trying not to oil up the tape with your fingers. After the tape is free, then it's time to pack up the tape and play it in another ADAT. Fast forward the tape to repack it. Back-up the important material on to a new tape and refrain from using the damaged tape ever again (if possible).

Note: A damaged tape may have unworthy sync information, so when making a backup of the source tape it would be best to perform what is known as a "two-to-one copy" or a "slave-to-master copy." Place the new tape into the first deck and slave the source tape to the new tape. While slaving the source to the master, use the digital out of deck two and copy the information into deck one's digital in. This will transfer the audio over to the new tape, but will maintain the integrity of the new sync information.

Danny O'Donnell
Service Center Administrator
Alesis

more letters on page 128

WRITE TO US

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CAN YOU AFFORD IT?

At first glance our MC 834 condenser microphone may look expensive, but nobody can tell how good it sounds just by looking... You must try one to experience the unique lack of colouration the MC 834 offers! Any serious professional knows that what you use at the front-end of your recording chain can make all the difference, the same rules apply in your project studio. You should demand low self-noise, excellent transient response and a wide flat frequency response.

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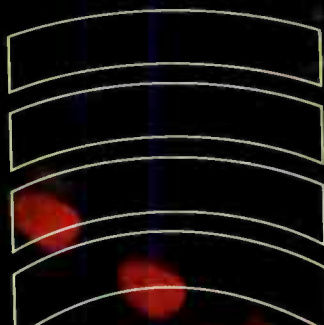
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Jacks Below

And Other Truths About 8-Bus Recording Consoles



Get Back Jack. Get Real.

Have you ever seen a pro-studio recording engineer mess with the cables on a console? Of course not. That's why true recording consoles have their jacks in back. Look at any console in any serious studio. Truth is, once the console is installed there's no need to change the setup. Like the TASCAM M2600MKII — the next-generation 8-bus. Available in 16, 24 and 32 input models, it looks clean, sounds sweet and works the way you want it to.

All Your AUXes. All The Time.

With 6 AUXes (2 are stereo), the TASCAM M2600MKII has more AUXes than any other console in its class. But the best part is — you can use all six — all the time. No other console in its price range can make that claim. That means you can use more effects, set up multiple independent stereo headphone mixes and have more flexibility. No limitations. And no repatching.

Get Out! Direct or With The Group.

A true sign of a recording console is direct/group switching. That's what makes recording with the TASCAM M2600MKII so smooth. Think about it. Send any signal direct to tape or disk by pressing one button. Or, send a group of signals direct to tape or disk just as easily — no patching here! You'll never have to crawl around or mess with your cables again. Spend more time recording and less time figuring out how.

The Features Demanded by Pros.

The M2600MKII has everything a great recording console should have — and more. It's an In Line configuration with flip switches. And you get your choice of balanced (+4dBm) and unbalanced tape ins and outs. Phantom power (48V) switchable in banks of 8 channels. And an optional multi-process meter bridge so you can keep your eyes on the board — and not your recorder. Plus, a semi-parametric split EQ on every channel and it's ready for automation using any of a number of third party packages.

Watch it. Do Those Switches and Knobs Wiggle?

Before you buy an 8-bus console check out the quality. Knobs and switches that wiggle are going to be a problem. For example, check out the controls and faders of the M2600MKII. No play, no wiggling. You can feel the quality. Feel those smooth long throw 100mm faders. Clean. And check out the ergonomics. Even the largest fingers will fit between the knobs. Try that on others!

Use A Solid Heavyweight.

TASCAM has built more recording consoles than any other manufacturer in the world. We know how to build a quality product that will last. The M2600MKII is a solid console. You can feel the difference just trying to lift it. Just compare it to the less serious lightweights on the market. Plus it comes with an extra heavy external power supply that delivers more headroom than anything else in its class. Just what you expect from the leader in multitrack recording.

Get Smart SmartSwitches™

The difference is in the design. This is a serious console. Take a look and you'll notice the design touches that distinguish the M2600MKII as the next-generation 8-bus console. Like TASCAM's exclusive self canceling and two-tone SmartSwitches — for protection from redundant operations and visual confirmation of all button positions at a glance. Quite a hassle on others!



Great Sound. The Next-Generation 8-Bus.

The real truth about a recording console is sound. With Absolute Sound Transparency™, high-end mic pre-amps, ultra low-noise circuitry, and high-output op amps, the M2600MKII is amazingly quiet, absolutely transparent and perhaps the best sounding console under \$20,000. And starting at only \$3,199, it's truly the sound decision for a next-generation 8-bus recording console. Put it on your shopping list today.



Maximum Headroom

Increased range of mic amp trim control down to 0dB accommodates +4 signals without using the pad — improves signal to noise ratio.



Double Reinforced Dual-Ground System

Wider ground line patterns on the PCB, extremely heavy gauge wiring, and enhanced electronics yields greater headroom and improved sound quality.



Dedicated Indicator Lights

Each SOLO and MUTE switch includes individual indicator lights so you are assured of their position at all times. No second guessing.



Semi Modular Component Construction

A more expensive, higher quality semi-modular design with 8-channel modular sections makes the M-2600MKII easier to service.

g In Back.

World's Best History

TASCAM M2600MKII The Next Generation 8-Bus



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CIRCLE 63 ON FREE INFO CARD



START ME UP

Q *I really look forward to reading every issue of EQ magazine. I also was very pleased to find a virtual overload of information that EQ (especially Eddie Ciletti and Craig Anderson) maintains on AOL. I really like what I have seen so far.*

I have been interested in starting a part-time recording studio for some time. I have worked with music and computers for years. I feel that I have a lot to offer others musically and technically; however, I am afraid and overwhelmed with the business end of it. I have a degree in marketing and just enough knowledge to know that you really have to know what you're doing or you can get yourself in a big mess legally and with the IRS.

I have several books on starting businesses, but none of them really covers the [business] aspects of a studio. Almost every studio book deals with recording or making music. Do you know of a book that deals with starting a small-budget recording studio? I know I am not the only person in this situation. Can you help? Thanks in advance.

*GSI Magic
via America Online*

A Keep reading. However, start reading books on how to operate a small business. The greatest mistake people make regarding a studio business is to try and run it like some artsy project. It is a business first — cold and simple. Please lose the notion of running a “part-time” recording studio. There is no such thing. Either you are in or you are out. A studio will quite simply take over your life. Once you have clients, there is no way to tell them, “The studio’s not open tomorrow, I’m going fishing...” (Unless it is a studio for your own projects, and even then you will still have clients — hopefully — with schedules.) With that in mind, here are some points to consider:

- Get a good lawyer. Someone with music-business experience would be

great, but you really need someone experienced in small business affairs, e.g., the incorporation process, tax requirements, insurance, and so on.

- Get a good accountant. ‘Nuff said.

- Run the studio as a business, not as a creative art pastime. Let the clients do the creative work. It’s your job to set up a well-equipped, well-staffed, well-run studio they can depend on.

- Get to know your local bankers. Small business loans don’t come easy.

- Contact the local Small Business Administration. They can help you with loans, networking, and advice. Speak to the local Chamber of Commerce. They sometimes like to assist new small businesses. Offer to record gratis (at first) local public service spots for your town, city, or state.

- Use your marketing experience. If you take two studios with the same equipment and level of expertise, the one that gets the word out and caters to its clientele best will usually be the last one left standing. Budget in proper advertising and marketing along with the equipment.

- Pick a game plan. That is, what type of recording do you want to do — jingles, pop music, voice-overs, remote? What kind of recording studio does your area need? What does it already have? Check out the competition. Where are they located? Pick out a niche that allows you to get into the game. Once you are successful, you can adjust the formula.

- If it gets too expensive or confusing, find a partner. Perhaps there already is a studio owner in town who could use a partner to share expenses, equipment, and clients. Pick the right partner (check those books with an accountant!), and you might have a win-win situation.

- Remember the studio-owner’s motto: “You’ve got to be crazy to be in this business.”

Keep in touch.

Hector G. La Torre
Executive Director
EQ Magazine

SYNC OR SWIM

Q *I’m a bit confused as to the meaning and use of the terms “video sync” and “word clock.” Are they the*

same? If not, what are the differences between the two?

*Stuart Adams
Rio de Janeiro, Brazil*

A Sometimes dissecting a cliché is a great way to understand the fundamental reason behind a principle. In this case, the phrase “timing is everything” couldn’t be more apropos. The terms “word clock” and “video sync” are used interchangeably, with both referring to the importance of correct timing when using digital equipment.

What do I mean by “timing”? Well, as you may know, the term “word clock” refers to the reference timing clock, or sampling rate, of a piece of digital gear. Digital equipment works off a sample rate, which is usually 44.1 kHz (or cycles per seconds) in audio/CD production and 48 kHz in video. If you take the inverse of this sample-rate number, for example, 1/44,100th of a second for 44.1 kHz, this means that, as every second goes by, there are 44,100 on/offs, or 1’s and 0’s occurring. Each of these is called a “sample” or “word.” Word clock refers to the rate of speed with which each of these events occur. Each machine in a digital chain must not only have the same sample rate, but each 1 and 0 must occur at the same time.

Enter video sync. Video sync (or composite sync) is a video reference signal that consists of either normal video picture information or “black burst,” which is just a video signal with a blacked-out picture. Video sync is used in applications where a digital audio recorder is to be referenced to the same sync as that in a video system. With video sync, your timing is based on the pulse frequency of the video signal being used as a reference. When digital audio equipment is used in a video application, the goal is to “match” or “synchronize” both audio and video clocks to have a common timing reference.

As you can see, timing really is everything when it comes to operating solely in a digital audio or video environment.

Tim Derwallis
Product Manager
Sony Pro Audio

THE POWERSTATION.™



19" rack mount sides available

THE INTEGRATION OF SOUNDRAFT QUALITY AND LEXICON DIGITAL EFFECTS

With our new Powerstation we've designed much more than just another powered mixer. Not only have we eliminated the need for a separate power amp, but we've built in one of the highest quality digital reverb units available today. The Powerstation provides everything you need between stage and speakers in a single package.



LEXICON PROCESSOR - The most respected name in digital effects, gives you a carefully selected range of unique effects that will enhance your creative control.

POWER AMP - Most powered mixers in this range have earned a reputation of underpowered performance especially with the many power hungry professional speakers available today. But the Powerstation delivers 300 watts (into 4 ohms) per side which drive even a power hungry system to very LOUD levels. And we do it with the lowest distortion figures in the industry (THD = 0.025% @ 4 ohms/both channels.)

TRUE BRITISH SOUND - The one thing no other mixer in the world can offer is Soundcraft's British EQ. That clean, crisp mix that defines

British Sound. Our 3 band EQ and sweepable mids provide the sound quality that made Soundcraft famous. We've also packed the Powerstation with:

- **BULLET-PROOF MIC PRE-AMPS** - Our exclusive **Ultra-Mix™** pre-amps give you more signal handling capacity to connect signals ranging from low output dynamic mics to active DI boxes without the fear of clipping.
- **7 BAND GRAPHIC EQ** - A true creative tool that allows you to handle the acoustics of any room.
- **HIGH PASS "RUMBLE" FILTER ON EVERY MONO INPUT** - Now you can eliminate low frequency rumble before it has a chance to fog up the mix. We've even included a sub sonic filter just before the power amp input to eliminate "DC-Shift" in the main speakers - a major cause of speaker damage when working at high levels.

One of the most amazing things about the Powerstation is that we've managed to package all of this performance for less than \$1600. See your nearest Spirit dealer today for a demo and you'll understand why British Sound is *back in the U.S. . . . back in the U.S. . . .*



SPIRIT, THE NEXT BRITISH INVASION



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By Soundcraft

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For the Spirit Dealer nearest you, call 1-801-566-9135

CIRCLE 89 ON FREE INFO CARD

FIELDS OF DREAMS

Q Thanks to Eddie Ciletti for his EQ maintenance column. It provides just the right amount of technical info coupled with easily understandable and applicable explanations.

As a first year engineering student at the University of Alberta in Canada, I will soon be reaching the point where I branch off into a selected discipline (Mechanical, Electrical, etc.).

Coming from a musician/recordist/sound tech background, I'm trying to determine the most appropriate path to follow, with the eventual goal of being involved in audio R&D. University department heads are of little value because they seem to have little interest or knowledge on career options in the audio industry, so that is why I pose the question to you: What areas of specialty do you see developing in audio over the next few

years, and what kind of skills/educational requirements would be most beneficial? Any recommendations or insights?

Thanks for your time.

Sheldon Radford
via America Online

A I've been in this business for a while, and I still continue to modify my direction. I learned a few things at the '95 AES show; for example, DSP programmers do need to understand the math for designing analog circuitry — especially to come up with algorithms that emulate analog's nonlinearities. So, how about learning programmer's languages such as C/C++? They seem popular, as does UNIX. Surprised? If you are into electronics and audio and have not gotten into experimenting with hardware, do so. Also, try to diversify (whatever suits you, of course), because no matter what your love is, you need to have an understanding of the "other" disciplines. Computer-related subjects such as networking, multiplatforms, and so on, are very important. So is an organic knowledge of circuitry. You might also try calling Motorola and investigating an EVM5600? (the "?" signifies which DSP) evaluation board. It interfaces to a PC and you can download a library of very basic programs. I'm going to try it just to see how intense it is. (The price should be about \$150; see Motorola's ad in the October issue of EQ.)

Good luck.

Eddie Ciletti
Contributing Editor
EQ Magazine



In-ear monitoring. Everyone's talking about it. But what do you really need to know?

Garwood earned its reputation with the Radio Station, the only in-ear monitoring system with a proven track record on the international touring circuit. Garwood's unique design team of sound engineers working with RF specialists has now produced the Garwood PRSII. The system, delivering each performer's monitor mix in stereo via a powerful UHF transmitter and receiver, shatters all previous price points for in-ear monitoring.

How much?

- Less than the cost of a monitor speaker system
- Artist controls the volume of the mix
- Complete freedom of movement for the user
- Safer to use
- Simple to set up
- Easier to transport



The face of live performance
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get answered.

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“Best sounding, most reliable amp on the road ... hands down.”

Dave Shadoan
President, Sound Image

112 PowerLight 1.8's on tour with Jimmy Buffett and Melissa Etheridge



The PowerLight Series includes the 1.0, 1.4, 1.8 and the new PowerLight 4.0, rated at 2000 watts per channel into 2ohms, weighing only 29 pounds!

**New High Power
PL 4.0 Available
Now!**

When PowerLight™ Professional Amplifiers were introduced in late '94, we said they were the best sounding amps we had ever made.

Now that they've passed the ultimate road test, you can take somebody else's word for it. After more than a year on tour with some of the best sound engineers and hottest acts, PowerLight amplifiers have delivered on every kind of performance and musical demand—*unplugged* and *fully wired*—without missing a beat. In fact, PowerLight has emerged as the new standard in *sound quality* and *reliability* by which all other amps will be compared.

What makes PowerLight amps work so well?

Refined "stepped linear" output circuits for optimum efficiency. PowerWave™ Switching Technology for tighter, fuller sound. Remarkable 2ohm load performance with unsurpassed thermal capacity. Extensive, proven protection circuitry, providing continuous fail-safe operation. Full compliance with worldwide safety and EMC requirements assures trouble free system integration.

And PowerLights are extremely *light*. At a fraction of normal weight, the road crew will have the last word of praise.

So, when touring sound companies like Sound Image and Jason Sound stake their reputation on a power amplifier, it *really* makes a statement.

For more details, call 714-754-6175.

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“the PowerLight Series will be my choice for a long, long time...”

Jeff Lilly
President, Jason Sound

100 PowerLight 1.8's on tour with Bryan Adams, Sarah McLachlan and Crash Test Dummies

CIRCLE 47 ON FREE INFO CARD

THE COMPRESSOR LIMITER EXPANDER/GATE

The name that defines great compression!

A/B the sound with and without sidechain processing. No patching required.

OverEasy®-- the choice of top professionals for soft-knee compression.

12-segment gain reduction meter allows precision monitoring of compression.

Tells you when the zero-attack PeakStopPlus™ limiter is doing its thing.

Link both channels the best way with True RMS Power Summing—a very musical way to achieve stereo compression.



Flexible expander/gate works over a 70 dB range.

Monitor sidechain processing when setting up the unit.

Prevents low-frequency energy from punching holes in the sound.

Get that classic dbx sound by selecting program dependent attack and release times.

Monitor either input or output signals.

The illuminated switches are not only cool, but are easily seen in light or dark.

Internal power supply with easily replaceable power cord.

Easily accessible fuse—you'll probably never need to find out how easy.

Connect the unit hassle free using either unbalanced or balanced 1/4" TRS or balanced XLR connectors.

Ensure signal path integrity with gold plated locking Neutrik® XLR connectors.

Add processing to detector path for frequency-conscious compression/gating/special effects.



THAT WILL TURN THE WORLD ON ITS EAR.

AGAIN.

You've seen and heard dbx signal processors for as long as you've been involved with audio. After all, our boxes are in daily use all over the world, with major touring companies, world class recording facilities, radio and television broadcast facilities and anywhere else audio professionals ply their trade.

Now, after over twenty years of pleasing the most finely tuned ears in the business, dbx has done it again with the new 1066. The dbx 1066 will, of course, be the standard against which all compressor/limiter/gates are judged. State of the technology VCA's, meticulous component selection, and scrupulous testing procedures are just a few reasons the new dbx 1066 is the latest in a long line of pedigreed signal processors.

So head on down to your local dbx dealer and audition this box. We're sure you'll see why the dbx 1066 is destined to turn the world on its ear.

For more information contact us at:
(801) 568-7660
Fax (801) 568-7662
dbx 8760 S. Sandy Parkway, Sandy, UT 84070 USA or if you prefer surfing to snailing send e-mail to customer@dbxpro.com

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CIRCLE 27 ON FREE INFO CARD

Over/Under LED's let you know at a glance if you're expanding/gating.

3-segment OverEasy® indicator lets you know when that classic dbx compression starts happenin'.

Fully adjustable attack and release controls offer maximum flexibility. or (see #7)

Peak-reading meter allows easy setting of optimum input and output levels.



Vary the Ratio to select anywhere from gentle downward expansion to gating.

Detented controls and soft-touch knobs assure precision adjustments.

Adjusts from mild compression to ∞:1 limiting.

Add make-up gain or match levels over a 40 dB range.

Newly developed PeakStopPlus™ circuit intelligently tames signal peaks.

Add optional custom dbx output transformers manufactured by Jensen®.



Servo-balanced outputs drive up to +22dBu

Convert semi-pro -10dBV signals to the dbx 1066's professional +4dBu internal level.

Precision balanced inputs reject hum and noise in tough audio environments.

Separate sidechain send and return jacks —no special "insert Y-cables" required.

Heavy-duty steel chassis will take years of road use and abuse.

EQ PRODUCT VIEWS

STAND UP RACK

Music Industries Corp. has introduced the new QL-400 Studio Locator Stand. This latest Quik Lok stand is designed to support all well-known professional studio remote units and other electronic studio components. It is designed to hold small professional studio gear as large as 17 1/4 inches to 23 3/4 inches wide, and 26 inches deep. For more details, contact Music Industries Corp., 99 Tulip Ave., Floral Park, NY 11001. Tel: 516-352-4110. Circle EQ free lit. #102.



KEY ENHANCER

Philips Key Modules' IS 5021 and IS 5022 sound enhancers include a digital sound processor, a sample-rate converter, a D/A converter, and a 20-bit A/D converter. Both units offer scratch suppression (declicking), noise reduction, stereo enhancement, simple EQ, and jitter removal. The IS 5021 features a semi-pro package design, with analog interface and digital S/PDIF ports, while the IS 5022 is designed for rack mounting with both balanced and unbalanced analog and digital S/PDIF- and AES/EBU-format I/Os. For more information, contact Philips, distributed by Mackenzie Laboratories, Inc., 1163 Nicole Court, Glendora, CA 91740-1416. Tel: 909-394-9007. Circle EQ free lit. #104.

EXPAND YOUR SOUND

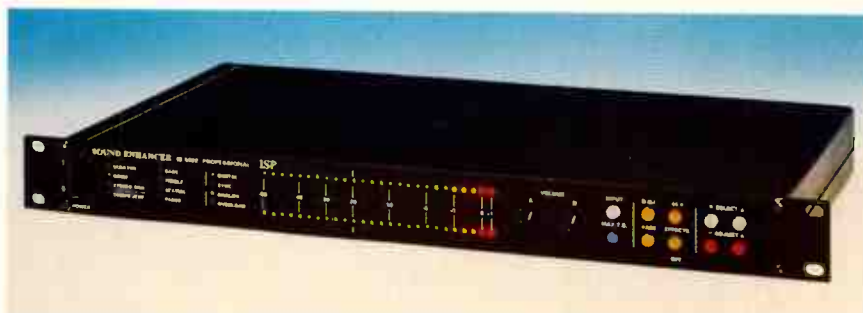
Roland's new Sound Expansion Series modules offer Roland sounds from the JV and XP Series synthesizers, and they can be used with any MIDI keyboard. The modules offer a variety of genre-specific



(e.g., dance, orchestral) sounds. There are five models to choose from: the M-GS64, the M-SE1 String Ensemble, the M-OC1 Orchestra, the M-VS1 Vintage Synth and the M-DC1 Dance. Each of the models offer 8 MB to 10 MB of wave memory that is configured into tones and patches for instant performance applications. The M-GS64 is a single-rack-space version of the SC-88 Super Sound Canvas. The module offers 654 tones and 24 rhythm sets with two MIDI inputs. The M-SE1 String Ensemble features string patches with newly developed waveforms, including some which feature Roland's RSS 3-D sound technology. The M-OC1 Orchestra features 8 MB of waveforms and patches from the SR-JV80-02 Orchestral Expansion Board. The M-VS1 Vintage Synth features 8 MB of waveforms and patches from the SR-JV80-04 Vintage Synth Expansion Board, and the M-DC1 Dance features 10 MB of waveforms and patches from the SR-JV80-06 Dance Expansion Board. For more information, contact Roland, 7200 Dominion Circle, Los Angeles, CA 90040. Tel: 213-685-5141. Circle EQ free lit. #101.

WHAT A STUDIO PRO

Studio Pro has released a line of project studio acoustic treatments — the SP-1 Quarter Round Wall Panel and the SP-16 Bass Absorber. The SP-1's dimensions are 7.5 inches wide by four feet tall, and features Studio Pro's Black Sporadic Diffusive Fabric that achieves full bandwidth acoustic control. Studio Pro's acoustic treatments are designed so that anyone can install them by following the sample layouts provided. They are applied easily with a staple gun. The SP-1 comes in 10-piece packages at a retail price of \$300. The SP-16 Bass Absorber dimensions are three feet tall by 16 inches in diameter, with absorption down to 35 Hz. For more information, contact Studio Pro, 1101 Walnut Ave., #G, Huntington Beach, CA 92648. Tel: 714-374-9585. Circle EQ free lit. #103.



Pro Mix 01 AND THE SUBTLE ART OF eq.



ProMix 01 parametric eq gives you dozens of frequency centers in three overlapping bands, from a very low 32 Hz to a sparkling 18 kHz. Q is adjustable in 1/6th octave steps with low and high frequency shelf. A graphic LCD display shows the details of every move you make.

Call the 800 number below for your free ProMix 01 Video and Application Guide.

Mixing is something like painting. Whether it's for a live audience or in the studio, equalization, or eq, is like the "palette and brushes" that let you adjust the shade and tint of each sound in your mix.

In the eq world, true parametric eq is the most precise of all. But it can be very expensive. It's normally available only as an integral part of a large console. Or as a separate add-on unit that can cost thousands.

So why would someone pay big bucks for parametric eq? With ProMix 01 you can afford to find out—because ProMix 01 is the only mixer in its class with true parametric eq on every input channel.

Fundamentals and harmonics: the hues and tints of music.

Each sound in your mix is made up of many "colors" or frequencies. If you look closely at a shiny object, you notice it's not simply gold or silver—it

displays a complex array of colors that let you know it's reflective.

When you listen to a sound by itself, you mostly hear its predominant frequency—the fundamental. But like the shiny object, if you listen closely you'll hear subtle frequencies called harmonics that give the sound its character.

Eq lets you control these subtleties. Making an acoustic guitar seem larger than life—more out-front—by simply boosting the high-frequency harmonics from the strings. So the guitar becomes more noticeable in your mix, without

actually raising its volume.

You can also use eq to solve problems in a mix. Such as removing feedback in a live concert; removing hum or noise from an electric instrument; or taking the "edge" off an instrument that's stealing attention from a lead vocal. With eq, you can make sounds stand out or blend in. In short, it's the accent that can turn a group of sounds into a great mix.

A different shade of blue?

Most equalizers give you a pre-determined choice of two or three frequency locations at which you can boost or cut. That can be really limiting—like having only two or three colors to paint with. You'll quickly discover this when you want to add presence to your vocal track, solve a feedback problem, or remove electronic "hum," and need frequencies that fixed-band equalizers don't provide. Parametric eq, as provided by ProMix 01, gives you a spectrum of frequency choices. Like having all the colors of a color wheel available to paint with.

What size brush?

In addition to frequency and gain controls, the true parametric eq on ProMix 01 includes a Quality Factor or "Q" control. Going back to our painting analogy, Q is like the width of your paintbrush. It lets you determine how wide or fine an effect you want the eq to have. Unlike the pseudo-parametric or "sweep" eq some mixers provide, true parametric eq lets you boost and cut subtleties in your mix with the precision of a Renaissance artist.

The ProMix "Paint Box."

Now that you know why parametric eq is so highly regarded, just imagine applying that artistic freedom to your next project. What could you do with more colors and more control over them? With 3-band parametric eq on every channel and the main stereo output, ProMix 01 gives you dozens of frequency centers to choose from. It's like enhancing your mix with a paintbox that includes every color in the rainbow.

A memory for the details.

ProMix 01 also saves you time by remembering all your eq settings in memory. So once you've found that magic eq curve, you can instantly call it up weeks later, along with all the other settings in your mix. ProMix 01 even includes a built-in eq library which holds 30 time-tested eq curves for you to use. You can call these up as starting points, modify them according to taste, and store your own custom settings in the library for use at any time. The large, backlit LCD display gives you visual as well as precise numeric representation of your eq on each channel—making eq'ing with ProMix 01 an illuminating experience indeed.

We could go on and on about ProMix 01's other advantages. But that's another ad. In the meantime, get the book and see the movie. **Just call 1-800-937-7171, ext. 550** for your free copy of the new ProMix 01 Application Guide and Video. Then take a spin at the dealer nearest you, and see how ProMix 01's parametric eq handles the curves.

ProMix 01 gives you three bands of true parametric eq. As well as a library of 30 time-tested eq curves, plus room for 20 more custom curves of your own.

Ext.
1-800-937-7171
550

EQ LOW MID HIGH LIBRARY

YAMAHA
Smart Mixing

CIRCLE 70 ON FREE INFO CARD

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EQ PRODUCT VIEWS



MYTEK SHOULD BE YOUR TECH

Mytek's stand-alone mastering quality meter shares the Sony 1630's ballistics and overload indication, plus adds features such as peak

counter, phase meter, VU metering, and more. The Mytek meter is software-based, and additional functions are included in various software versions and upgrades. Up to 12 of the Mytek meters fit into one 19-inch rack space, and one individual unit measures at 1.43" x 5.25" x 5.5". Power is achieved through an external international (100–240 VAC) power adapter, which Mytek includes with your purchase. The Mytek meter is portable and can be placed on top of a console bridge, mounted into a console, or in a 19-inch rack space (with optional hardware). For details, contact Mytek, P.O. Box 1023, New York, NY 10276. Tel: 212-388-2677. Circle EQ free lit. #105.



IT'S BEGINNING TO LOOK A LOT LIKE...

This is a must for the merry engineer this holiday season. The LED-Tric Christmas Tree is indeed a Christmas tree that has 18 multicolored super bright LEDs to make it a wonderful decoration piece for your studio. The LEDs are driven by three separate oscillators to create a random twinkling of light. The seven-inch tree consists of three PC boards that form the 3D branches that display the red, orange, yellow, and green lights with open circuitry. The branches are snow-capped with the white silkscreen parts legend. It operates for one month on two "C" batteries that are included. Retail price for an assembled tree is \$45, and if you're feeling handy, for \$35 you can get a disassembled kit. For the full, merry details, contact Vista, Box 1425, Bolingbrook, IL 60440. Tel: 708-378-5534. Circle EQ free lit. #106.

WHAT'S GOOD FOR THE GOOSE

The Juice Goose Rackpower 320 offers a solution to AC ground-loop problems. If your system experiences a hum, by flipping one of the 10 ground-lift switches on the front of the Rackpower it will open the third pin AC ground circuit on one of the outlets on the back of the unit. If that outlet is in the ground loop, the loop goes away — as does the hum.



The Rackpower 320 features the safety of a ground fault interrupt circuit that will terminate all current to the unit in the event of unsafe levels of ungrounded electric power. Audio noise caused by grounding problems within an audio equipment rack can be eliminated without having to disconnect and reconnect individual pieces of equipment. For further information, contact Juice Goose, 7320 Ashcroft, Suite 104, Houston, TX 77081. Tel: 713-772-1404. Circle EQ free lit. #107.

I CAN SEE A NEW HORIZON

Alesis ADAT users should know about Horizon Music's additions to its Solution Series product line. These upgrade boards are total board replacements for the Input Analog Section, Output Analog Section, and 18/20-bit A/D and D/A sections of the ADAT machine. The Horizon Music Input Board for the ADAT adds 1/4-inch balanced-in capabilities. This input section can adjust the input impedance and gain to match the input device. The ultra-high bandwidth devices and circuit layout can deliver a frequency response from DC (0 Hz) to greater than 70 MHz at a slew rate of 450 volts per microsecond with a very low THD and noise floor. The Horizon Music Output Board adds the same enhanced performance as the input section with the ability to drive up to 50 mA output. For more information, contact Horizon Music, Inc., P.O. Box 1988, Cape Girardeau, MO 63702. Tel: 800-651-3507. Circle EQ free lit. #108.



TANNOY®

Get Real



PBM II

For more than three-quarters of a century, Tannoy has been designing and producing loudspeaker systems and components to meet the demands of the world's most demanding user. A philosophy of constant research and investment in state of the art materials, technology and processes enables Tannoy to ensure that every monitoring system we produce will re-produce absolute fidelity to the source, true dynamic capability, and most importantly, real world accuracy. This is why Tannoy systems are used in more of the world's professional facilities than any other brand.

In the North American marketplace, Tannoy has been the number one monitor of choice for several years according to the Billboard's international recording and equipment statistics. This clearly illustrates why Tannoy enjoys its reputation as the world's leading manufacturer of reference loudspeakers. In fact, **leading the market is what Tannoy is all about.** While other multi-faceted manufacturers, not dedicated solely to the

art of reference monitor loudspeakers, scurry to produce products to compete with Tannoy's original highly acclaimed and award-winning PBM series, **Tannoy moves on.**

The new PBM II series, once again, is setting new standards in the industry. Pioneering new technologies such as variable thickness, injection molded cones with nitrile rubber surrounds are but one fine example of our dedication to perfection. The new molded cones are stiffer than conventional cones producing more linear extended low frequency. They are better damped for reduced distortion and exhibit more naturally open and detailed midrange. They are immaculately consistent and durable for years of faithful trouble free use. From the high power polypropylene capacitors to the hardwired minimalist crossover, every component has been carefully selected for the new breed of PBM II series. When leading edge technology is so affordable, *Get Real.* Don't settle for second best.



EQ PRODUCT VIEWS



XL-ENT PREAMP

Midas is offering its new XL42 preamp/EQ system for applications requiring a strong front end — such as stereo recording. Features on the new XL42 include XL4 four-band parametric EQ, high-pass filters, mic/line preamps, phase reverse switch, 48-volt phantom power, switchable send/return on each channel, input/output level control, 10-segment LED, daisy chain capability, dip switches to assign to console mute groups, electronically balanced inputs/outputs, and optional input/output transformer balancing option. For more information, contact the Mark IV Pro Audio Group, 448 Post Rd., Buchanan MI 49107. Tel: 616-695-4750. Circle EQ free lit. #109.

LET'S GET HIGH

The HD/CD Digital Audio Processor from Pacific Microsonics reduces distortions in the A/D conversion and D/A conversion processes. It features independent linear power supplies and digital processing. For details, contact Pacific Microsonics, 2560 Ninth St., Suite 219, Berkeley CA 94710. Tel: 510-644-2442. Circle EQ free lit. #110.



COOL OFF

Carvin's latest power amplifiers feature exclusive "Front Pull" fan-cooling systems that draws cool air from the front and exhausts to the rear, different from other amps which suck in warm air from the



back of the rack. The cool air is directed across specially "staggered" 33 amp MOSFET devices on a massive "cross-flow" aluminum heatsink for maximum cooling efficiency during full-power operation. Carvin's amps all utilize super duty, linear power supplies that include custom-manufactured toroidal transformers. There are three amps that make up this new series: the F300, the F600, and the F1200. The F1200 features Carvin's new PowerMax switch, allowing true continuous full-power output into 2 or 4 ohms. Also included on the F1200 are professional Speakon connectors for industrial hook-ups. All F-Series amps have full thermal, short-circuit, and speaker protection. For more details, contact Carvin, 12340 World Trade Drive, San Diego, CA 92128. Tel: 800-854-2235. Circle EQ free lit. #111.

HAVE YOU HEARD?

Keep your studio accessories and keys safely stored with **Middle Atlantic's** (201-839-1011) LBX Lockbox. It's available in either three- or four-space versions, and comes with a hinged door and sturdy lock...**Marantz** (708-820-4800) has two new CD players, the PMD320 and the PMD321. Also from Marantz are two professional cassette decks, the PMD501 and the PMD502...A newly formed alliance between **Spectral** (206-487-2931) and **Broadcast Electronics** means that Spectral's Prisma Editing System can be used to produce soundfiles for use with Broadcast Electronics' AudioVAULT system. Now radio broadcasters can get creative in their real-time playback of digitized music, commercials, jingles, and so on...Dream a little dream of **Euphonix's** (818-766-1666) CS2000F Film Re-Recording Console. This digitally controlled analog system includes dynamic automation and SnapShot Recall...**Roland** (213-685-5141) introduced another Users Group called the Sampler Collection. Now all of you sample heads can compare sampling notes and receive Roland's cool newsletter, *In the Loop*...Here's another web site for you computer devotees to check out from the folks at **EMUSIC** (310-979-3125). The web site contains more than 100,000 CDs by artist, album, or song title. Oh, by the way, you'll need the address — <http://www.emusic.com>...**Ampex's** (415-367-3889) new DDS Digital Data Cartridges are designed for use in studios working with DAWs and nonlinear editing systems. The high-density tape is 4 mm in width and is available in 60- and 90-meter lengths...Take out your address books, **Garwood** (215-860-6866) has moved to the home of the Liberty Bell. The new address is Garwood Communications, The Atrium, Suite 10H, 4 Terry Drive, Newtown, PA 18940. Philadelphia was chosen because of its central location to key metropolitan areas...Wonder what \$149 could buy you these days in pro audio gear? You could get yourself a **Bensen Audio Labs** (708-860-3870) BA25 cardioid microphone. Designed with the vocalist in mind, the BA25 features a NoBoom multistage windscreen, and an internal neoprene shock mount...In closing, we'd like to wish **Aphex Systems** (818-767-2929) a happy 20th Anniversary. Keep on tubin'.



CATCH THE WAVE

Yamaha's new QS300 Music Production Synthesizer is an all-in-one synth, tone generator, and sequencer. It features Yamaha's XG format, which offers extensive sound control. Project studio owners will make use of the stereo multieffects processing and Yamaha's Advanced Wave Memory two-tone generation system for professional sounds. There are a total of 932 voices and 22 drum kits, as well as 3093 drum patterns, bass lines, and other instrument parts. The QS300 features a 24-track sequencer with an 86,000-note and 10-song capacity. One hundred preset musical styles (each with eight sections), 100 user phrases, and 100 user-pattern locations allow for a variety of compositions and arrangements. Retail price is \$1895. For details, contact Yamaha, P.O. Box 6600, Buena Park, CA 90622. Tel: 714-522-9011. Circle EQ free lit. #134.

BBE ALL THAT YOU CAN BBE

BBE Sound Inc. has launched the 362NR Sonic Maximizer, which couples BBE Sonic Maximizer with a noise-reduction unit all in one package. Being that the 362NR is not an effects unit, it can be inserted into the signal path directly between the equalizer and the electronic crossover and power amps. It works by applying phase compensation to the low-, mid-, and high-band areas, as well as dynamically controlling the amplitude relationship between the same frequencies. For more information, contact BBE Sound Inc., 5381 Production Drive, Huntington Beach, CA 92649. Tel: 714-897-6766. Circle EQ free lit. #135.

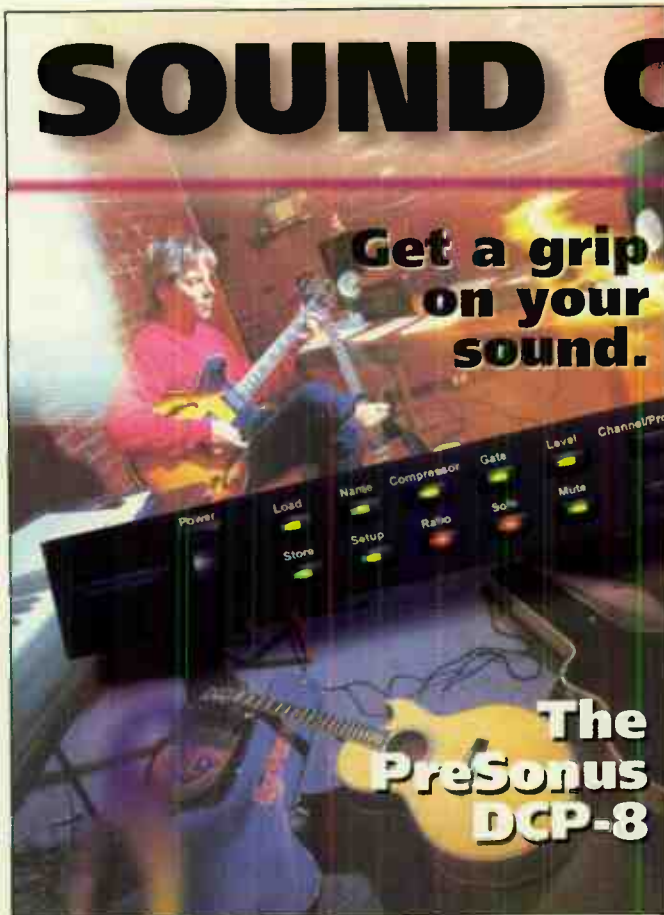
LA LA LAND

Affordability is the name of the game for LA Audio LITES' new MX2 dual-channel mic preamp. The MX2 utilizes the same analog circuitry and built-in headroom as the CX2 compressor and GX2 noise gate. Enhanced features include two independent channels of transformer balanced inputs on XLR, stereo balanced XLR and 1/4-inch jack outputs, individual gain controls, filtering and output level per channel, LED metering, a -20 dB pad, and a +48-volt phantom power. The MX2 comes in dynamic green and is rack mountable. For details, contact LA Audio, SCV London, 6-24 Southgate Rd., London, N1 3JJ, England. Tel: 0171-241-3644. Circle EQ free lit. #136.



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EQ STUDIO WARE

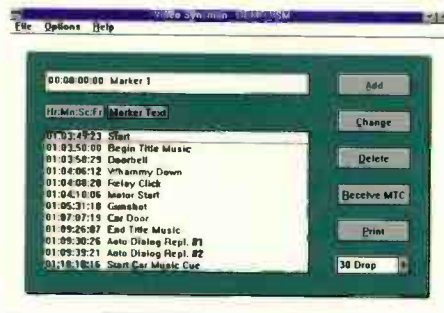
TIME FOR MEDIAMATRIX

TimeLine has increased the capabilities of its Studioframe DAW with the addition of Peavey's MediaMatrix. The MediaMatrix sound card allows users to construct digital audio mix channels using predesigned building blocks that include filters for up to 24-channel mixers and multiple parametric and graphic EQs, delays, and compression. For more information, contact TimeLine, 2401 Dogwood Way, Vista, CA 92083. Tel: 619-727-3300. Circle EQ free lit. #112.



GET A CUE

MIDIMAN is right on time(code) with its new Video Syncman program. Video Syncman can read, write, and translate three forms of timecode: LTC (longitudinal), MTC (MIDI timecode), and VITC (vertical interval timecode). Because Video Syncman can read and write VITC, and because VITC can be read from a video even when the video tape is paused, Video Syncman can read still-frame timecode. This ability yields many MIDI and audio sequencer functions. An example is Video Syncman's Cue Catcher feature which allows users to shuttle a video to any location, still frame the video, record the frame location, and name it. Up to 256 of these cues can be printed out as a "cue sheet," saved to disk, or exported as a Standard MIDI file — type 0 or 1. For more information, contact MIDIMAN, 236 W. Mountain Street, Suite 108, Pasadena, CA 91103. Tel: 818-449-8838. Circle EQ free lit. #113.

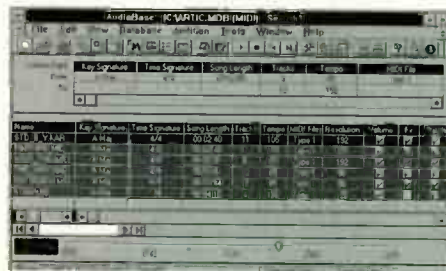


WILD CARD

The new Sonic Solutions Multitrack USP Sonic System links multiple UltraSonic Processor (USP) cards installed in a Macintosh computer to create Sonic System DAWs supporting "wide-track" performance. Sonic's Multitrack USP offers up to 64 channels of input and output and 80 to 100 separate simultaneous disk playback tracks. The USP card includes four Motorola 56002 DSP processors clocked at 66 MHz, as well as a high-speed SCSI controller, four serial/SMPTE ports, and a digital audio interface capable of input/output of up to 16 channels of audio in either professional-quality digital or analog formats. Multitrack USP is capable of recording, editing, filtering, and mixing audio with full 24-bit resolution. In addition to its multichannel capability, the Multitrack USP also provides new multitrack optimized editing features, including instant punch-in/punch-out. The system has been designed to operate at high sampling rates such as 88.2 and 96 kHz. For more information, contact Sonic Solutions, 101 Rowland Way, Suite 110, Novato, CA 94945. Tel: 415-893-8000. Circle EQ free lit. #115.

STEAL A BASE

To help manage MIDI and .WAV files, check out Artic Software's AudioBase (Windows) software. AudioBase can be used for searching purposes when you are in need of finding a specific file. Users can find all the MIDI files that contain system exclusive messages and are sorted by key signature. AudioBase automatically catalogs MIDI and .WAV files that reside anywhere on your hard drives, CD-ROMs, or other removable media. When AudioBase catalogs a file into a database, it doesn't just log simple filename information, it stores real information about the file such as tempo, time signature, song length, and more. Users can audition any soundfile of multiselection or soundfiles that have been cataloged into a database. For more details, contact Artic Software, P.O. Box 28, Waterford, WI 53185-0028. Tel: 414-534-4309. Circle EQ free lit. #114.

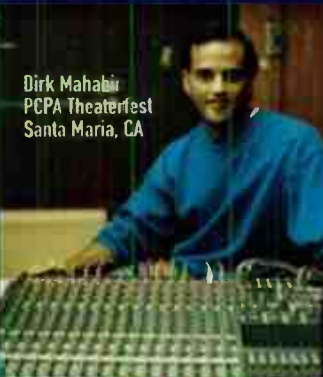


THEY SHOWED US THEIR MACKIE MIXER

This is a tiny fraction of the mailbags of photos we've received from Mackie mixer owner's lately. All we did was place an enny weeny ad that read "Show Us Your Mackie" in the back of a few magazines. The response was incredible. 1000's of snap shots of Mackie owners from around the world. Call us toll-free for a complete information packet on our compact mixers and 8•Bus consoles. You'll learn why no other mixer manufacturer could ever get the kind of enthusiastic response that we did.



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Monterey Park,
CA



Dirk Mahabir
PCPA Theaterfest
Santa Maria, CA



Doug Draben, Omaha, NE



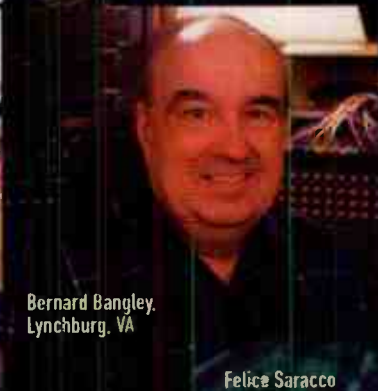
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Philadelphia, PA



Desirée Tallman
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CIRCLE 42 ON FREE INFO CARD

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ADAT-XT



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provides all the critical information. Wrap all this well-thought-out technology in an utterly professional six-pound solid die-cast aluminum chassis. Of course, make it 100% compatible with over 60,000 ADATs

already in use world wide. Introducing the new, definitely improved **ADAT-XT 8 Track Digital Audio Recorder**. Consider it a think tank for your creativity. See your Alesis dealer. Don't think twice.

Again



For more information on the new ADAT 7, visit our Authorized Alesis Dealer or call 310-841-2272. The Alesis ADAT 7 offers the advantages of the world's largest digital multitrack user base as well as an extensive list of compatible products from our Creative Developers in The ADAT Group. Alesis and ADAT are registered trademarks, and ADAT 7 is a trademark of Alesis Corporation.

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ALESIS

CIRCLE 13 ON FREE INFO CARD

The House That Sam Built

The Rock 'n' Roll Hall of Fame honors the place where it (supposedly) all began — Sun Studio

NAME: Sun Studio (a.k.a. Memphis Recording Service)

OWNER: Sam Phillips

LOCATION: Originally located at 706 Union Ave., Memphis TN, these pictures are from the Sun Studio exhibit at Cleveland's Rock 'n' Roll Hall of Fame. (The Union Ave. location still exists for tourists and sessions.)

CREDITS: "Rocket 88," Jackie Brenston and his Delta Cats (widely acknowledged as the first rock 'n' roll record); "That's All Right," "Blue Moon of Kentucky," "Mystery Train," Elvis Presley; "Great Balls of Fire," "Whole Lotta Shakin' Going On," Jerry Lee Lewis; "Blue Suede Shoes," Carl Perkins; "I Walk the Line," "Folsom Prison Blues," Johnny Cash; lots more.

CONSOLE: RCA 70-D [1935]. This board was designed for use as a radio station control board. Phillips bought it for \$500 in 1950 and completely rebuilt it. It was used in every recording session at Sun.

MIC: Western Electric. Phillips used this mic, called a "salt-shaker mic" — to talk to the musicians in the studio.

DISC RECORDER: Presto 6N turntable and lathe [1948]. Phillips used this lathe to create acetate master discs from the studio tape masters.

RECORDERS: Two Ampex 350's [1954]. By using the 350's, Phillips was able to create the famed Sun echo effect by bouncing the signal from one machine to the other.

MONITOR: Control Room Speaker [1949]. Phillips designed and built this speaker himself. It is a bass reflex design.

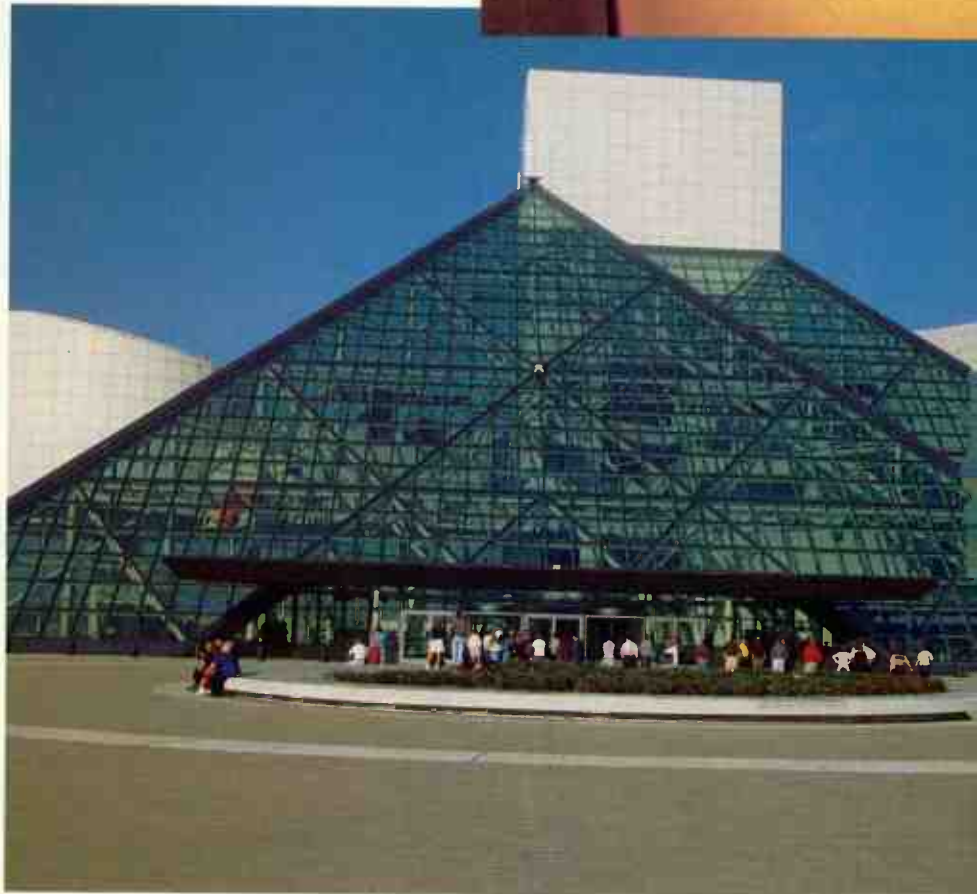
KEYBOARDS: Wurlitzer Spinet Piano, Model 2100. Originally purchased in February 1950, Jerry Lee Lewis and other Sun artists used it until 1959, when Phillips moved it to his home.

SPEAKER: RCA Model 11401 [1947].

Phillips used this speaker to play back recordings in the studio.

STUDIO NOTES: When he opened the studio in 1950, Phillips's goal was to make quick money by selling personalized recordings of personal events, such as weddings. His early recordings were by the likes of B.B. King, Howlin' Wolf, James Cotton, and Rufus Thomas. Ike Turner, who played on "Rocket 88," acted as Phillips's talent scout in the South.

SUN STUDIOS TODAY: To see the actual equipment used in these historical sessions, visit this display at the Rock 'n' Roll Hall of Fame, 1 Key Plaza, Cleveland, OH 44114. Tel: 216-515-1212. The studio itself still stands on Union Ave. The front office is a gift shop, and the studio is arranged as though sessions were still going on, which, in fact, sometimes happens — U2, Ringo Starr, and Michelle Shocked have recently recorded there. Call 901-521-0664 for more information. **EQ**





CLOCKWISE FROM TOP: The studio's Wurlitzer; an equipment list on the glass outside the display tells what's in the exhibit; the entire exhibit; the studio control room; the outside of the Rock 'n' Roll Hall of Fame.

Photos by Larry Hamill



AUDIO INTEGRITY

You are busy trying to create the perfect mix, so we'll get right to the point. The new Sony DPS-V77 is a single rack powerhouse — a digital multi-effects signal processor that combines the best of our DPS Series, for an impressive array of effects including reverb, delay, modulation, dynamic filtering and more. The V77 also offers balanced and unbalanced analog and digital I/Os, with high resolution 24-bit A to D, 20-bit D to A converters and Sony's proprietary 32-bit digital signal processing. Result: great sound in, better sound out.

DUAL EFFECTS ARCHITECTURE

With 50 effects per block, the dual block architecture of the DPS-V77 makes it extremely flexible, since it allows for various serial and parallel configurations. Each block is equipped with a switchable

IT'S A SIGNA



IT'S A GARBA

pre or post effect EQ. You'll find 198 user presets in addition to 198 factory presets. You'll also discover several new, ear-opening effects, from intelligent pitch shifting to irregular delays, to mono/stereo conversion, and three-dimensional spatial placement. The most important feature, however, may be what this unit *doesn't* come with.

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MORPHING

Nietzsche once said, 'get rid of the junk you don't need.' Or something like that. Anyway, sound philosophy for life is sound philosophy for signal processors. So, that annoying drop-out you get switching

L PROCESSOR.



GE DISPOSAL.

between effects? It's history. Eliminated. Toast. Seamless transition – say, between the tail end of a reverb into a chorus – is now reality. With this 'morphing' function of the DPS-V77, a new effect (like a chorus or flange) can begin while a current effect (like a reverb or delay) is decaying, giving you from 0 to 10 seconds transition time.

USER FRIENDLY

Take a good look: nice, big LCD display and "jog/shuttle" knob. Numeric key pad, descriptive icons. Assignable direct access keys, located where they ought to be. Call up a preset and up to 6 of your most frequently used parameters are there instantly. All this, plus full MIDI

control. So work flows quickly, smoothly, easily. As easy as calling

I-800-635-SONY, ext. DPS, for more information. Imagine. No more fumbling, grumbling, mumbling with a whole rack of trouble. No more extraneous junk. If only the rest of your problems were this easy to drain.



SONY

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AMEK



The EQ

The tradition The pedigree

System 9098 Equalizer by Rupert Neve the Designer



"The SYSTEM 9098 EQ is a high performance Equalizer and Preamplifier designed to originate microphone signals of the highest quality and to process signals generally in terms of frequency response. The circuitry is based on the research I put into the 9098 console and the approach bears many similarities to that used in the 9098. Paramount importance has been given to the sonic quality of the audio path, taking great care to retain the highly-prized musical character of the famous old designs of this pedigree.

The SYSTEM 9098 EQ embodies the original curve shapes now enhanced by improved circuitry which provides swept frequency bands in place of the discrete switched steps of the past. Thus the EQ has become even

more powerful yet remains a subtle and creative tool, using the same basic circuit configurations which have been successful over many years. However, new amplifying devices and better quality components have resulted in lower noise, lower distortion and the ability to handle higher frequencies.

The result is an equalizer which has the solidity and sound of Class A without the cost, heat and weight penalties and thus provides the 'best of both worlds'. We have also left behind cumbersome and expensive hand cabling, noisy connectors, heavy separate power supplies and outdated assembly techniques which contribute nothing but nostalgia. Apart from the robustness, repeatability and reliability, we have now made one of my designs more affordable than ever before."



The System 9098 EQ is a Member of the Parametric Equalizer and 2 Track Stereo Equalizer

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Fax: 0161 834 0593

AMEK US Operations:
Telephone: 818 508 9788
Fax: 818 508 8619

AMEK Germany/Mega Audio:
Telephone: 06721 2636
Fax: 06721 13537

AMEK Asia:
Telephone: 65 251 1629
Fax: 65 251 1297

CIRCLE 01 ON FREE INFO CARD

Neumann U67

Bobby Darin crooned away into this vintage classic at the famed Capitol Studios

MICROPHONE NAME: Neumann U67

SESSIONS: You can hear this mic in use on Bobby Darin's Capitol Studios recordings (1962–1965).

TYPE OF MIC: Vacuum tube condenser

PRICE WHEN NEW: Around \$400 (1960)

CURRENT VALUE: Between \$3000 and \$3500

POLAR PATTERN: Omnidirectional, cardioid, or figure-eight

FREQUENCY RESPONSE: 30 Hz to 16,000 Hz

POWER SOURCE: External

RATED SOURCE IMPEDANCE: 200 ohms (internally changeable to 50 ohms)

OUTPUT LEVEL: 2.0 millivolts (cardioid)

PAD SWITCH: –10 dB


LOW-FREQUENCY ROLLOFF: 100 Hz

TUBE: EF 86 select

DIMENSIONS: 201 mm (length) x 56 mm (diameter)

WEIGHT: 0.54 kg

MIC NOTES: The U67 was manufactured from 1960 through 1981, but even after production ceased, demand for the mic remained. In 1993, Neumann reissued the U67 exactly as it was originally produced, utilizing the same parts as the original model. This includes the capsule and tube, as well as a custom-manufactured output transformer that precisely matches that of the original '67. The U67 has gained legendary status as "the" tube mic for recording vocals and is considered the "father" of the U87a, which shares the same capsule and housing.

USER TIPS: Unlike many tube microphones with switchable pickup patterns, the pattern selector switch for the U67 is on the body of the mic as opposed to being at the power supply. Try recording backing vocals with a '67 set to the figure-eight pattern. Place one vocalist directly in front of the mic and the other directly behind the mic. Due to the bidirectionality of the pattern, both vocalists will be effectively on-axis simultaneously, preserving the tonality of the microphone. 



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You've seen waveguides on high end studio nearfields, but no one has ever seen anything like this: our Elliptic Conical Waveguide™. It works with the LA325's 2-in exit compression driver (like the ones in our large touring systems) to project high definition upper octave detail in live sound nearfield applications (15 to 65 feet).



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Peavey PS 2482 Console

New convenience
features highlight
Peavey's first
8-bus board

BY STEVE LA CERRA

Peavey has firmly stepped into the ring of 8-bus recording consoles by introducing the Production Series 2482 [\$5859.99]. This new addition to Peavey's well-established Audio Media Research product line brings technology formerly available only in the company's more pricey desks down to a point attainable by studios with a modest budget.

Whereas Peavey's 2400, 1600, and 800 Series desks utilize split-console technology, the PS 2482 employs the inline approach that has become more widespread over the past few years. In addition, Peavey has included a lot of important features, including at least one that very few manufacturers have addressed in this price range.

The input and output jacks for interfacing the PS 2482 are located at the rear of the top panel, allowing for easy viewing and, if necessary, repatching. Each channel has a discrete-transistor mic preamp with switchable 48-volt phantom power, an input pad (which makes high-output mics easy to deal with), and the one thing rarely found on boards in this price range: a polarity reverse switch. (*Thank you Peavey!*) I find this feature essential when miking a drum kit or multimiking a guitar amplifier. Being able to check the effects of polarity reversal with the push of a button (as opposed to running into the studio and changing the mic cable to one that has been specially wired to reverse polarity) is fast and very low on the brain-damage scale.

Signals may be soloed PFL or in stereo. When a signal is PFL'd, the master meters show the true level of

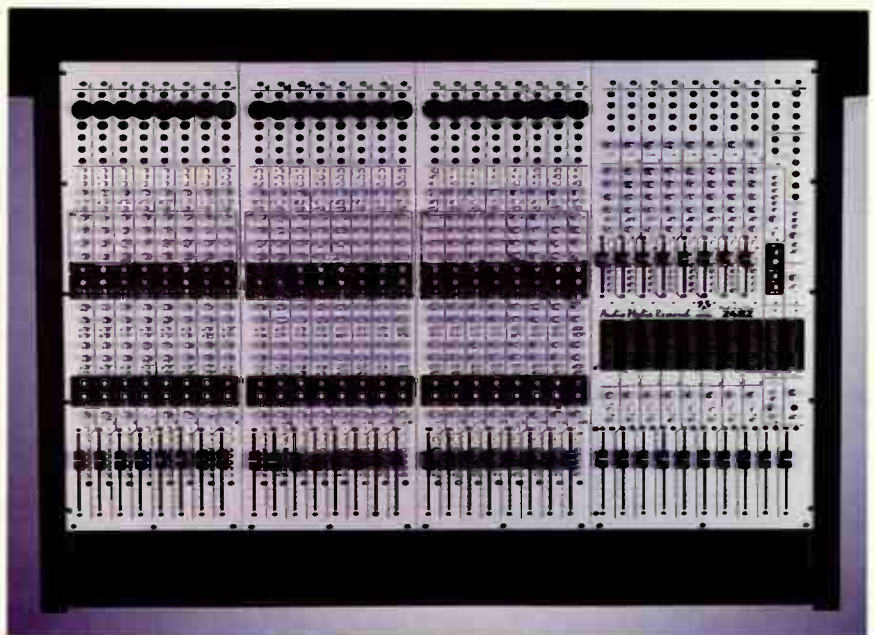
that signal. Peavey's metering scheme is definitely designed to help you get the best possible signal level from input to output. A two-color LED on every channel illuminates green for signal present and red for clipping at any point in the chain. The L-R master outputs (as well as the optional 24 x 2 meter bridge) feature Peavey's Delta VU metering. This LED ladder-type display simultaneously indicates peak level (shown by the LED at the top of scale) and average level (shown by the LED at the bottom of the scale). Any LEDs that would indicate a signal level below average do not illuminate. Useful and very easy to read.

In addition to the mic input, every channel has a line input, a tape return input, and an insert that uses a single 1/4-inch unbalanced TRS jack for the send/return patch. That's not so unusual, but Peavey has handled the tape return inputs in a manner that really sets the PS 2482 apart from other 8-bus production consoles. The 2482 actually includes dual-tape input jacks for every channel: an unbalanced RCA jack at -10 dB and a balanced TRS jack at +4 dB. This allows the board to accommodate just about any type of multitrack machine.

Like most inline consoles, the PS 2482 has a secondary signal path on the input strip, but Peavey has added a twist or two to the signal flow. There are six auxiliary sends (with alternative paths for flexibility) and a stereo tape monitor send with pan and level controls. This alternate mix can be used as a separate monitor mix when tracking or can be assigned to feed the L-R mix, thus doubling the number of inputs on remix. Since the output of the alternate mix appears separately at the jack panel, it can also be switched to function as auxes 7 and 8.

A 4-band EQ section (high- and low-shelf and sweepable high-mid and low-mid) normally applies to the signal at the 100 mm fader, but the shelf EQ can be split out to the alternate input, providing EQ for the tape returns. The EQ is a unique design known as "wein-bridge" circuitry developed by Peavey engineers for the consoles in the Production Series. Using this circuit allows Peavey to reduce the number of operational amplifiers to about 1/4 of those used in a conventional EQ circuit, the result being reduced noise and increased transparency because there is less "stuff" in the signal path.

continued on page 130



THERE'S A SWITCH: A Polarity Reverse switch is one of the convenience features found on the PS 2482.



**2:00 a.m. The band
just found the sound
they've been looking for.
Everyone's rockin'.
Except you. You're figuring
out how to tell them the
HIGH OUTPUT master
you were using just
"crapped out."**

Of course, you wouldn't be having this anxiety attack if you used new **BASF 900 maxima** High Output Mastering Tape. With 3 dB more output and 2 dB less noise than standard analogue mastering tapes, it is identical to the MOL and the signal-to-noise ratios of other high output masters. But it has the reel-to-reel reliability and consistency

of BASF 911. Low rub off. Precision-manufactured. It's classic BASF. The kind of BASF tape studios have been relying on since 1934. As you turn to face the band (gulp), you make a vow. If you survive the next ten minutes, the first thing you'll do is contact BASF, 1-800-225-4350 (Fax:1-800-446-BASF); Canada 1-800-661-8273.

DEMAND IT.



Kravitz "Rock and Roll is Dead"

It may be dead, but it sure sounds good.
Engineer/Producer Henry Hirsch explains why.

BY STEVE LA CERRA

EQ: On the CD, Lenny is credited with playing drums, bass, electric guitar, and vocals. How did the recording evolve?

Henry Hirsch: We started out recording the song on an old 3M M56 1-inch, 8-track machine, but we ended up bumping the 8-track over to a 2-inch, 16-track M56. The drums came first and were actually recorded onto

only one track of the 8-track machine. As we were working on the song, we experimented on the 8-track and realized that we would need more tracks, so we went to the 16 and the 8-track became sort of a safety — the drums are actually one generation down. The 16-track machine was made in the 1960s and has discrete electronics. They are like effect boxes or sound devices — I can overdrive tracks or do phasing effects and can create sounds that just don't happen on newer machines. And if you overdrive a digital machine, it just sounds horrible. We recorded at 15 ips on 3M 996 tape at +4 dB with no noise reduction — I like what happens to the low end at 15 ips.

When Lenny played the drum track, I played bass and Craig Ross played guitar for reference. We did the drums in the live room here at Waterfront Studios (NJ), which is a large room but is kind of dry. Some live rooms have a lot of splatter, and

the snare can be too loud when you mic the room, but in this room I can get the ambiance without the wash of a really live room. I used a combination of close and far miking with a Sennheiser MD421 a few feet away from the kick, a Beyer M201 for the snare, a Neumann U67 behind the kit, and an AKG C24 out in the room facing the wall. There were no close mics on the toms. Lenny has this old EMI REDD 37 tube console from Abbey Road studios that we ran the mics through, and then the whole kit went through an old RCA BA6A tube compressor/limiter, which is great for drums. We actually premixed those mics down to one track and printed the mix on the 8-track tape, so we had to get the balance right from the beginning. I really wasn't going for a pristine recording. I was trying more to create an illusion of atmosphere, which is more important to the vibe of the song. Once we were on the 16-track machine, Lenny overdubbed the rest of the instruments.

Was the bass recorded direct?

Lenny played through an Acoustic 360 bass amplifier (with 15-inch speakers) that has an overdrive control that we used to get just a bit of fuzz into the sound. The cabinet was miked with a Neumann U67 and was heavily compressed with a Fairchild 670 tube limiter, which I really like to use. We didn't use any kind of direct bass sound, which I find to be one-dimensional.

And the guitar sound?

I think Lenny played a Les Paul through either a Fender Twin Reverb or a Vox amplifier. Sometimes I mic the amp in the front, the rear, and out in the room, but for this song it was a U67 about four feet in front of the amp and another one facing the wall out in the same live room that we did the drums in. Getting the mic in the right place at the rear of the amp takes time, and sometimes I simplify the miking for the spontaneity of the performance. I avoid dynamic mics on guitar amps if I can, but I also don't like to get too close with a condenser



LENNY FOR YOUR THOUGHTS: Kravitz' vintage gear is put to good use on his latest release, *Circus*.

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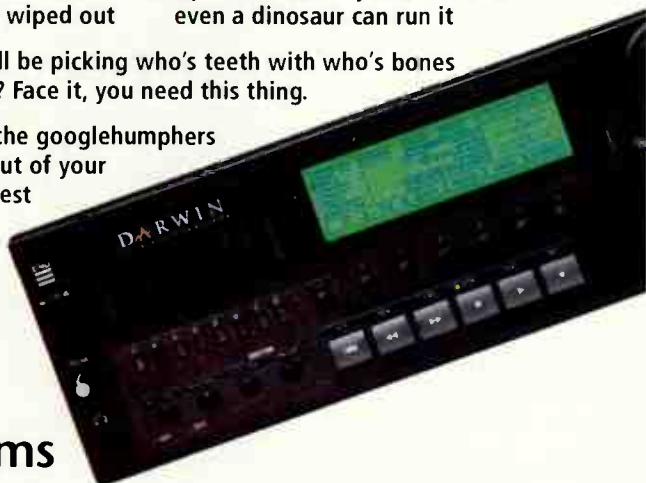
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EQ TRACKS

— there's no need to abuse the mic. I tried to get an illusion of depth on the guitar sound, so the two mics were recorded onto one track and then Lenny played a second pass for stereo. The guitar lick is the whole song, so it needed to be powerful.

How did you get the distinct tone on the vocal?

The vocals were recorded with a U67 and compressed with a Fairchild 670. We used a bit of compression on the way to tape but then compressed heavily in the mix. The lead vocal was printed flat to tape and then distorted in the mix. I ran the tape track to a Langevin tube mic amp, so naturally the output of the tape machine — which is at line level — overloaded the mic-level input of the Langevin. I controlled the amount of distortion by using pads on the mic pre and added a bit of the straight vocal in the mix to keep the intelligibility. I have tried running vocals through guitar amplifiers to create distortion, but the frequency response just dies when you do it that way. By overdriving the pre-amp, I can keep the wide frequency response of the sound and still get the distortion. The backing vocals were also recorded with a U67. Sometimes I'll use a U47 for the vocals, but the '67 seems to be able to stand up better to a vocalist that belts it out, whereas the '47 seems to lose its frequency response if the vocalist really hits the mic hard. The "rock and roll is dead" part of the hook is really heavily compressed, again with a Fairchild 670. I like the way the 670 can squeeze and tighten up a sound without taking all of the dynamics out. The backing vocals were recorded at Compass Point in the Bahamas, and I think we used an EMT 140 plate for the reverb sound.

For a song with a mono drums track there is a lot of depth to the recording. Actually, I monitor in mono quite a lot. I have an Altec 604D which I use as a mono reference in the control room and I find it easier to hear a clear balance between the instruments in mono. I switch back and forth between the Altec, a pair of old Tannoy Reds, and Yamaha NS10M's. Even when I'm listening in mono, I'm always trying to make the recording create an illusion of space and dimension.



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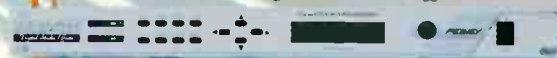
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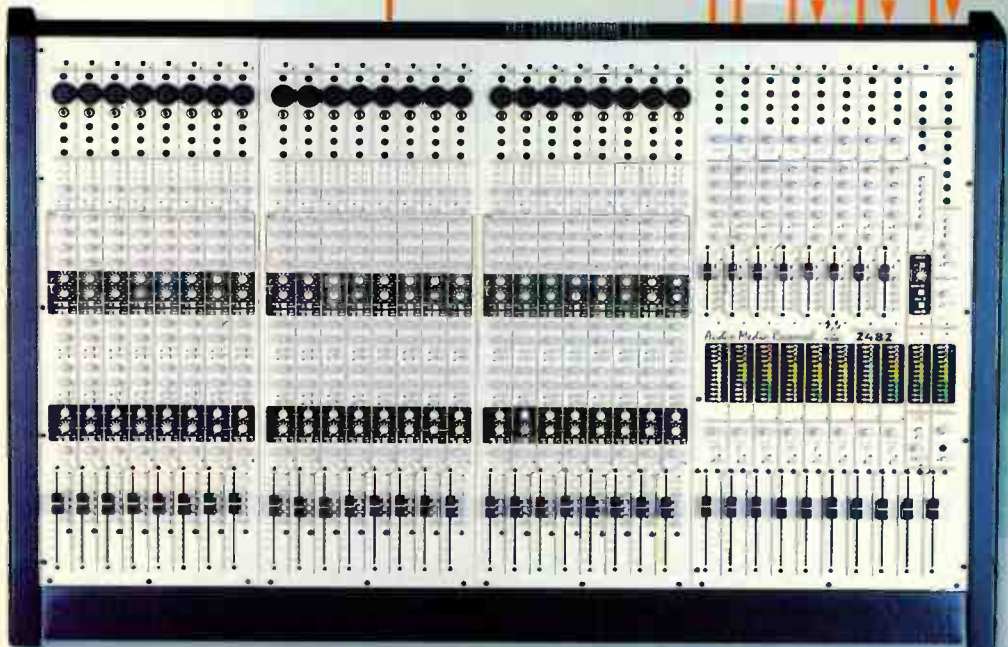
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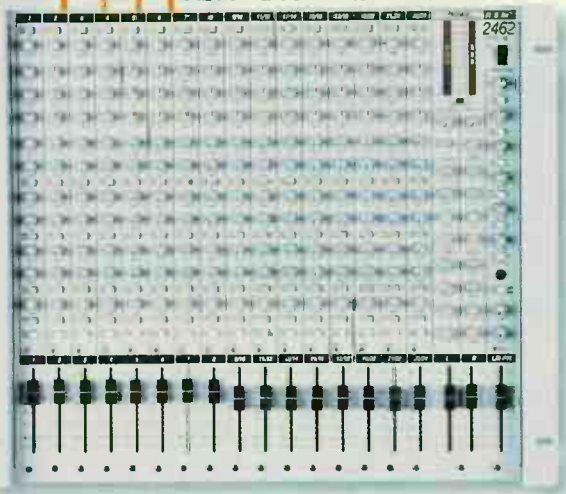
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I Think I Hear Voices...



Plain talk about vocal comping

BY CRAIG ANDERTON

For me, vocals have always had more to do with performance than technical proficiency. Trying to be emotionally engaging while punching in two words on one vocal line has never appealed to me — either as a performer or when trying to capture someone else's performance. Fortunately, digital technology offers an easy alternative to the formerly difficult practice of "comping" vocals (i.e., creating a "composite" track out of the best bits and pieces of other tracks).

TOOLS OF THE TRADE

In the analog era, the only way to make a composite vocal was to have lots of tracks available, console automation (or fast fingers with a nimble brain), and very good noise reduction. You'd record a bunch of vocals on different tracks, then listen (repeatedly) to each track and decide which parts to use (while putting more wear and tear on the tape, of course). Then you'd set up automation to bounce the right sections of

track, at the right times, to an empty "composite" track.

Multiple 8-track digital tape recorders with fancy remotes provide a major improvement for comping, since you can program an offset between two machines and "drop" tracks digitally into other tracks. Still, hard-disk recording (HDR) is even easier; you can nondestructively cut and paste segments of audio until you get the best possible vocal track.

I generally use digital tape as the "capture" medium and the hard disk as the "offline editor." I still find tape the fastest way to record tracks, mostly because of the dedicated, obvious control surface. I mean, record-enable a track and press play/record — hey, even a musician can do that! But for editing, it's time to go over to hard disk, and that's where comping really comes into play.

The following is referenced to an ADAT/Pro Tools-based system, but substitute some product names and you can apply this to other systems as well.

BE PREPARED

I got into doing comps to obtain a

more "spontaneous" feel to vocals. I know that seems ironic — assembling pieces of vocals together on a phrase-by-phrase basis sounds pretty calculating. What makes a good vocal performance, however, is when the performer is really into it, and the engineering doesn't intrude at all. The goal in my favorite approach to comping is to simply tell the vocalist "go," while you lay down track after track as quickly as possible (don't readjust mics or switch mics mid-stream; we're looking for consistency here). This requires preparation on everyone's part: the singer has to have the song down cold (this isn't the time to agonize whether the lyrics should be changed) and the engineer has to be able to keep the session moving.

By not doing punches, a vocalist can come in, do some quick, loose takes, then kick back. Singers hate to wait around; it's better to capture the performances while you can and apply the time you save toward "vocal postproduction." Comping may sound like it's designed for when you don't really know what you're doing and want to fix it in the mix, but that's

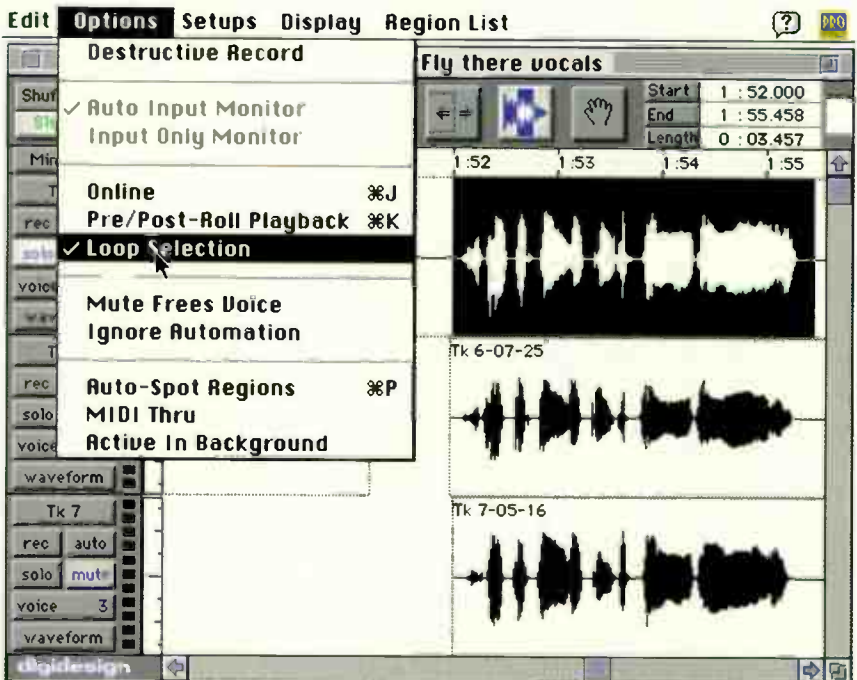


FIGURE 1: Loop 'n' listen.



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MI INSIDER

not the idea. The intention is to capture spontaneous moments, and then perfect the performance offline.

BOUNCING OFF THE WALLS

After recording, unless you're using an HDR system exclusively, you have to get signals from tape to HDR. There are hardware interfaces that allow you to transfer eight tracks at a time from the popular digital 8-tracks, but if you already have something like the AI-1 for ADAT, you can use that to transfer two tracks at a time.

Make sure the sync is set up correctly. When transferring from ADAT to Pro Tools, go to the Hardware Setup option and set the sync to Digital. That way Pro Tools gets its sync signal from ADAT. When going from Pro Tools to ADAT, select Internal sync. This allows ADAT to sync to Pro Tools. Be sure to check that the sampling rates match!

NATURAL SELECTION

Once your tracks have set up shop in the HDR, the next issue is auditioning each performance and deciding which parts to keep and which to toss. Note that different singers have different "rhythms"; despite the persistent idea that the first vocal often has some magical quality, the majority of the time it seems vocal #3 or #4 will be the best throughout. Some singers go downhill the more they do, whereas others get a second wind. It's different for each individual.

Auditioning tracks is very easy in Pro Tools. In fig. 1, a phrase has been looped, and "Loop Selection" has just been checked. When you go into Play, the defined selection will play over and over again on all recorded tracks. So, you can solo one track, listen through a couple times, solo the next track, listen through, solo the next track, and so on. Usually one of the takes will be a clear winner. If two lines are more or less equal, it's generally best for the sake of continuity to go with the one that follows the previous "winner" piece of audio.

"Separate" the region you want to keep, then drag it to the composite track you're building. In many cases, you can use most of a vocal and just do a few touchups to fix specific problems.

DOUBLE YOUR PLEASURE

One of my favorite vocal techniques is

doubling — where the singer sings a part, then tries to duplicate the same part. This duplication is never perfect, so there are always slight variations that add a full, chorus-like effect to the vocals.

I generally find that when a person concentrates on copying the original track as closely as possible, the doubled track suffers because the singer isn't concentrating on the performance, but on being "correct." On the other hand, with composite vocals, I seldom listen to previous takes while adding new ones; the end results are usually very similar anyway if you've practiced the tunes.

You'll still have occasions where a doubled part is great except for some nonfixable glitch — like the last word sustains more on one take, or one take drops in pitch a bit while the other one stays constant. Here's the fix: take the piece of audio that does work and use it to replace the one that doesn't. Next, change the start point of the copied piece of audio by about 20 ms (forward or backward, it doesn't make much difference). This provides the slight timing difference you expect from doubling, yet the performance will be "perfect" because you're using copied audio. It sounds very cool.

CLEANING UP

After creating the composite signal in Pro Tools, there are zillions of little regions of audio scattered across one or two (or whatever) tracks. To simplify things, bounce these to new tracks, and you'll have linear tracks that run from the start to the end of the tune. I usually work on pairs of tracks (lead and doubled lead, then a pair of harmonies), so I do the bounce in interleaved stereo form for later processing with Sound Tools. This is where I apply techniques discussed in previous columns: normalize phrases, add EQ, etc. I also use the Jupiter Voice Processor plug-in (from Jupiter Systems) a lot with vocals; the compressor/EQ combination works particularly well.

And that's the scoop on comping. Try it, you'll like it!

EQ technology editor Craig Anderton is an author, musician, and lecturer. He also hosts "Sound, Studio, and Stage" on America Online (keyword SSS).

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CIRCLE 43 ON FREE INFO CARD

Money for Something

Budgeting for a studio project, or how to avoid the *Waterworld* Syndrome

BY BENNET SPIELVOGEL

There comes a time in every band's career when it's time to go CD. Cassette demos are fine for getting local gigs, but when musicians want to hit the road, they need the promotion, airplay and sales potential that comes shiny, shrink-wrapped, and jewel boxed.

Why, then, do so many bands put off that crucial step as long as they can? The answer is what I call The *Waterworld* Syndrome: the fear that a major recording project will turn into a monster, running so far over budget that, like the infamous Kevin Costner film, it will sink any chances of turning a profit.

Experienced studio hands know how to pace themselves and keep costs under control. But to a band that hasn't recorded more than demos, a 13-song CD project looks like a vast, forbidding expanse of, well, *Waterworld*. Down under *Waterworld*, though, there's a golden opportunity lurking for a sensible studio operator. When I talk to a reluctant band, I tell them about my simple method for creating a studio budget. Not only am I helping them out, but I'm more likely to nab those major blocks of time for my studio.

To see how this works, let's look at a band I recently shepherded through the budgeting process.

SETTING YOUR OBJECTIVES

The band Cindy's Loose Booty attracted some of the best musicians in the state of Texas and was now ready to break in Europe. Cindy wanted to create a musical explosion overseas, and figured a CD would be the ticket. As a first step, even before setting a budget, I suggested she develop a series of



Photos by Ben Glass

SINKING FEELING: Control your budget or, like *Waterworld*, your project could sink fast.

concrete objectives that could be realized as a result of her recording and releasing her new CD. We came up with the following list.

- Generate money from sales at gigs and stores that take merchandise from independent artists.
- Promote the band's music — especially Cindy's song-writing skills.
- Get some serious investors interested in the band.
- Have a complete, bar-coded package suitable for licensing by an American or European label.

Cindy knew what tunes she wanted to cut, but what about formulating

a budget? Cindy and I broke the problem into four areas: 1) Basic costs; 2) Computing costs; 3) Scheduling time; 4) Reducing costs. Here are some guidelines we developed.

BASIC COSTS

The Studio. Look for a low-cost operation, but one that impresses the band with its staff, room(s), equipment, general feel, and, most of all, the sound of their productions. Figure somewhere between \$25–\$50/hour.

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(without NR @ 30 ips)/per 30 minutes (with noise reduction @ 15 ips); 1-inch, \$75 per 15/30 minutes without/with noise reduction; 1/2-inch, \$45 per 15/30 minutes without/with noise reduction; 1/4-inch, \$25 per 15/30 minutes without/with noise reduction; DAT, \$10 per 90 minutes. (Note: Most studios which *don't* use noise reduction generally operate their analog tape machines at 30 ips, while studios which *do* use noise reduction run their machines at 15 ips. Consequently, your analog tape budget will be higher if you don't use NR because you'll need more tape. Traditional noise reduction, of course, would play no part in digital recording, and so tape speed/recording time would remain unaffected.)

Caution: Beware of sliding into funny format land. Pick a studio that uses a tape format, noise reduction, and tape speed compatible with other studios in your area. If you begin work at one place and decide to go elsewhere, say to mix, format becomes an



issue. Also, make sure you collect or copy the track sheets and any applicable paperwork when you pick up your master tapes.

Musicians. Some prefer an hourly rate (which is often based on a three-hour minimum), some charge by the song, some by the day. It's all open to negotiation. Cindy planned to use her band, and pay them \$100 each for their services plus 5 percent of the gross from the first 1000 CDs sold (\$750 for each member @ \$15 CD).

Food. Go the ice chest route; drinks, salads, and sandwich stuff.

COMPUTING COSTS

If the band is rehearsed, has been together for awhile, and has a good feel for the process of how they want to lay down their tracks (i.e., rhythm tracks w/vocals, a few quick overdubs and mix), they can use the "two-hour-to-one-minute" formula. Plan on every finished minute taking two hours. Thus, a three-minute song will take six hours to finish. That's six hours to set up, record, overdub, evaluate, and mix.

Here's the formula for estimating raw studio costs (excluding outside musicians, food, and producer):

$1st(2) \times \$ + T = ESC$, or Total Song Time in Minutes $\times 2 \times$ Hourly studio rate (including engineer) + Tape = Estimated Studio Cost

Suppose you want to cut 13 songs, which you estimate as coming in at around 48 minutes total time. Forty-eight finished minutes of music multiplied by 2 gives 96 hours. Multiply 96 by the hourly studio rate (let's say \$40/hr., including engineer) and you get \$3840. Now add in tape costs (48 minutes of material translates to \$90 for ADAT 24-track, 6 reels) and the total becomes \$3930 or approximately \$300 a song. In this case, the band needs to budget between \$3500 and \$4500 for raw studio costs.

The 2:1 rule relies on an extremely aggressive schedule. In most cases, 3:1 (or three hours per one minute) may be more realistic. It gives you a little more breathing room, especially in the mix stage. The 2:1 rule also requires a fast and experienced engineer.

SCHEDULING TIME

In Cindy's case, since they needed almost 100 hours of studio time, the band agreed to work ten, ten-hour

days so they could stay within budget. Thirteen songs @ \$300/song and \$40/hr. for studio and engineer.

Because the band was familiar with the songs, I suggested recording basic rhythm tracks with scratch-but-possible-keeper vocals in two days (six songs the first day, seven songs the next). Vocals and overdubs on the next three days. And use the rest of the time, five days, to mix/remix.

This is a very balls-to-the-wall schedule, especially the first two days. Some bands might opt to do the basics for 13 songs in three days — five, five, and three — and then begin overdubs and mixes.

REDUCING COSTS

Here are some no-brainers that may help reduce costs:

- Practice and arrange the material before you get into the studio.
- Try making some 4-track or live-to-jam-box tapes and evaluate how your tunes and arrangements are working before going in.
- Keep overdubs to a minimum.
- If the rhythm tracks feel right, plow on. You may be able to cut your basics in less time than you allocated. Go for it.
- Work as a team. The studio is often a pressure-filled, fragile chemistry of sensitivity, egos, inspiration, and creativity. Do what you can to keep things moving in a positive way. Focus on the objectives you listed earlier.

FINAL RESULT

Cindy's Loose Booty stuck to their plan, cut the tunes, and stayed within budget. A couple of Cindy's tunes got picked up and placed with some major artists. Cindy decided to stay in Norway after the tour ended, cut the musick bizness loose, and fish for salmon. But since Cindy's Loose Booty is a fictional band, based on a composite of several bands that recently have come through my studio, let me add that her bass player and drummer formed a new band, which has since cut three CDs at my studio. And two cuts are going on the soundtrack of Kevin Costner's next film (*Waterworld II?*)...

Bennet Spielvogel operates Flashpoint Studios in Austin, Texas. Check out his "ADAT in the Trenches" article in EQ's August '95 issue.

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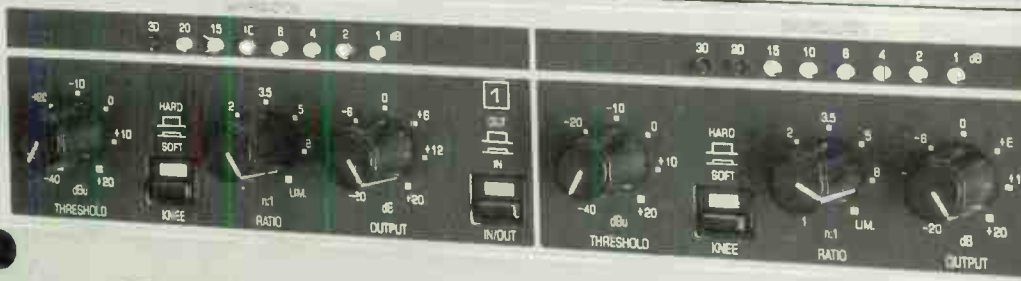
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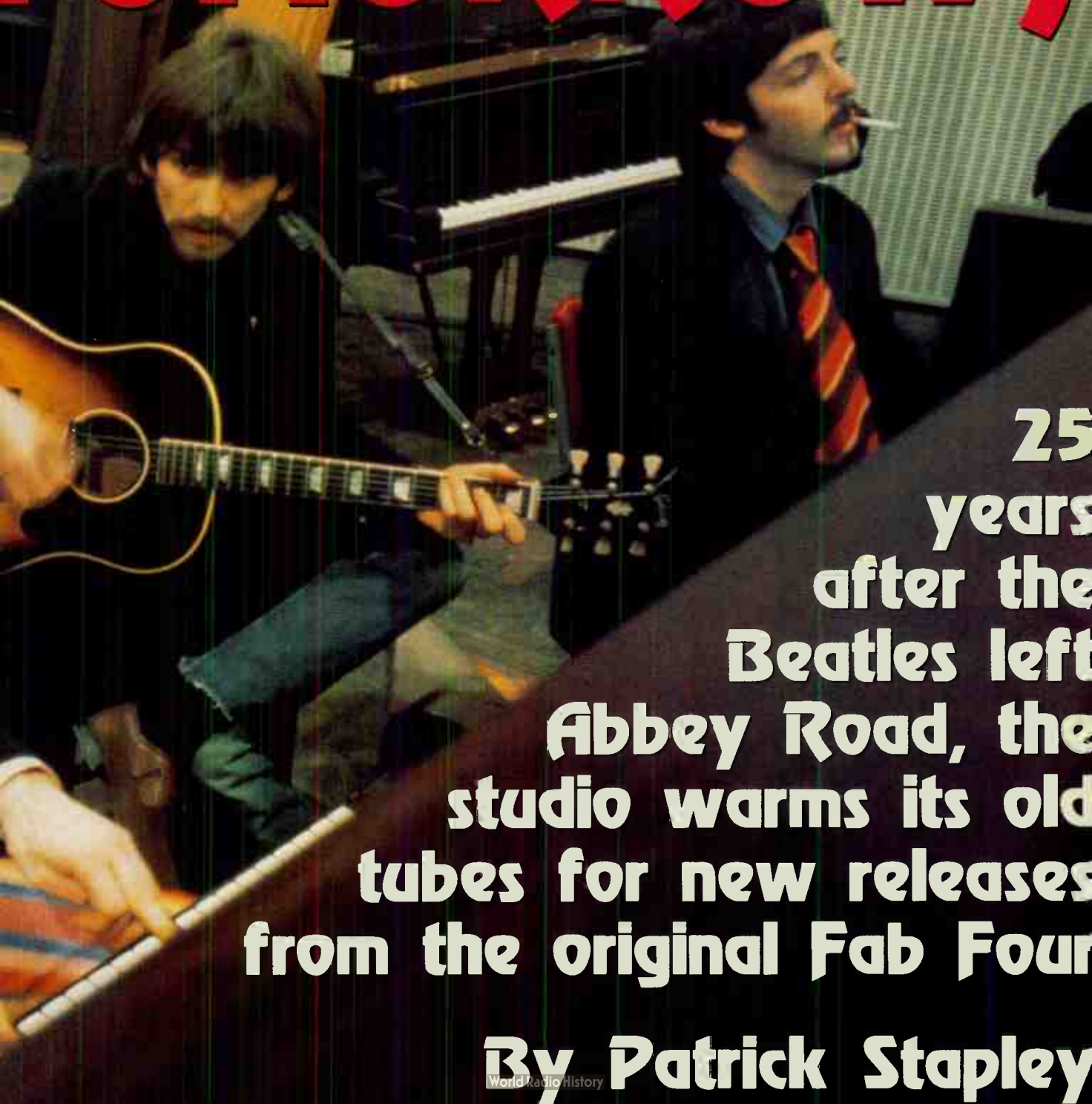


World Radio History

**THE
BEATLES**

BACK TO ABBEY ROAD

AY & TODAY (TOMORROW)



25
years
after the
Beatles left
Abbey Road, the
studio warms its old
tubes for new releases
from the original Fab Four

By Patrick Stapley

THE BEATLES

BACK TO ABBEY ROAD

Paul McCartney, Ringo Starr, George Martin, Geoff Emerick, and Jeff Lynne discuss the making of the Beatles Anthology and the two new songs.
(Photo Previous Page: © Apple Corps Ltd.)

Twenty five years after their last session at Abbey Road, the Beatles are back at the studios where they recorded over 90 percent of their music. Over recent months, the world's most famous recording studio has welcomed back its most famous clients — Paul, George, and Ringo along with producer George Martin and engineer Geoff Emerick.

In a shroud of secrecy, where studio staff have literally been threatened with dismissal if they so much as mention the "Beatles Project," preparation is underway for the release of a series of CDs that will not only contain previously unreleased Beatles songs, but also two newly recorded tracks that, amazingly, feature all four members.

THE ANTHOLOGY

The reunion has been as a direct result of the forthcoming *Beatles Anthology* documentary, to be screened on worldwide television this month. Five years in the making, the series charts the Beatles' career from birth to breakup and features extensive previously unseen footage collected from all over the world.

All three members have been closely involved in the project, and, according to an Apple spokesman, "got very hands-on" and provided many hours of interviews. "It's really our version of what the Beatles were all about," says Ringo, "giving individual perspectives, including John's."

To accompany the programs, EMI is releasing three double CDs containing a mixture of forgotten material, as well as different versions of well-known songs, demos, studio out-takes, live recordings, broadcasts, home recordings, and so on. This definitive collection of unreleased Beatles material, will also include the two new songs, "Free As A Bird" and "Real Love," which are to be separately released as singles. The first being premiered on television when the series starts on November 19.

THE ARCHIVE

Since the beginning of this year, George Martin, with the help of Abbey Road engineer and Beatles expert Allan Rouse, has trawled through the studio's archives searching for suitable material. Approximately 400 tapes (2-track, 4-track, and 8-track) from the EMI vaults and about half as many from external sources have been listened to.

"It's been a long haul," confirms Martin.



"We've covered every bit of recording we ever did all those years ago, listening to every take and every track of every take. It's been fascinating, traumatic, beautiful, and sad — all kinds of emotions — we've literally been reliving our lives."

The surviving Beatles have collectively returned to Abbey Road on a number of occasions during the year, sifting through material with Martin, helping to choose what should go on the albums. According to Paul McCartney, it's been a strange but enjoyable experience.

"It's quite weird sitting in Abbey Road's number two studio, where we always worked, listening to what we did when we were 20," he says. "But it's exciting as well. It's like being archeologists finding tracks that we didn't remember recording, uncovering songs that we didn't want or thought weren't good enough at the



Photo by Monty Fresco © Apple Corps Ltd.

GEORGE MARTIN: "We've covered every bit of recording we ever did all those years ago, listening to every take and every track of every take. It's been fascinating, traumatic, beautiful, and sad — all kinds of emotions — we've literally been reliving our lives."

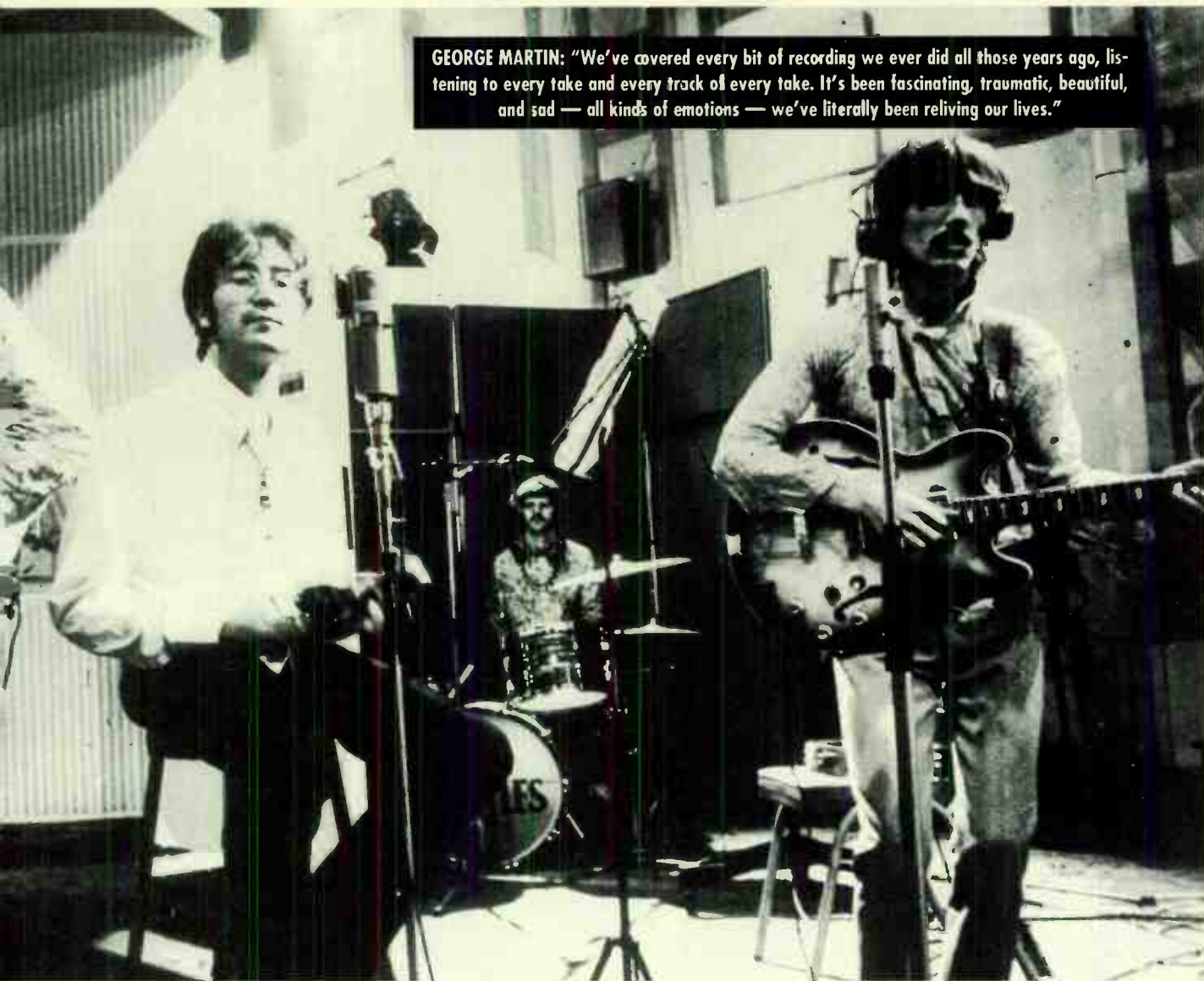


Photo courtesy of the Michael Ochs Archives

time. But now, of course, after 30 years they don't seem too bad at all."

George Martin too admits that he'd forgotten about some of the old material. "I'd certainly forgotten all about 'Leave My Kitten Alone,' which is very good. It's quite well known because it's been bootlegged, but I hadn't heard it for years and years. There were also some interesting little demos and things that I'd quite forgotten about, which will be on the albums."

An exciting discovery was a 30-year-old track written by George Harrison called 'You Know What To Do.' Feared lost many years ago, it apparently turned up inside an unlabelled tape box. "It's not the greatest thing that George ever wrote," remarks McCartney, "but I believe there will be a bunch of people interested in hearing a Beatles track from 30 years ago that no one to this day has ever heard.

Going back to the archeological analogy, if you find a little Egyptian pot, it doesn't have to be the greatest Egyptian pot, the fact that it is Egyptian is enough."

THE DREAM TEAM

The archive material is being treated in two ways. Where material exists only on 2-track, it is being directly transferred with the help of Sonic Solutions' No Noise processing to gently remove tape hiss. Where songs are on multitrack, they are being remixed, and this is where the talents of Geoff Emerick, who engineered the largest proportion of the Beatles' records, comes in.

George Martin was insistent that not only should he get the old team back together again, but also the equipment. "I told Rupert Perry at EMI before we started the project that I wanted to make the mixing as authen-

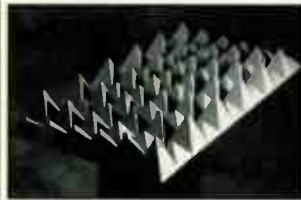
tic as possible. I said, 'Look you've got a vintage producer and a vintage engineer, so you're going to need some vintage equipment to go with it.' I certainly didn't want to do it on a modern desk.

"To translate those old 4-track tapes and put them through an SSL would do things to them that they were never intended for. So I was pretty adamant that we should try and get a desk from that period. It wasn't actually possible to get one from the '60s, but we did get one from about 1970 that would have been used at the end of the Beatles period, and it definitely had the right character about it."

The desk was an original EMI TG 8-track console — one of the first transistorized consoles to be installed at Abbey Road, and was hired for the project from producer and ex-Abbey Road engineer Jeff Jarratt. This, along with various vintage outboard, was

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THE BEATLES

BACK TO ABBEY ROAD

temporarily installed in Abbey Road's Penthouse Studio where it ousted an AMS Neve Capricorn.

"Although it wasn't a tube console, the old EMI desk really lent itself to the job and really suited the tapes," says Geoff Emerick. "As far as outboard, we basically used what we would have used then, which wasn't a great deal — Fairchild limiters and some extra EMI EQ units. Anything else like ADT (Automatic Double Tracking) or phasing we did in the old fashioned way, using tape machines.

"I've personally tried to keep

things as authentic as possible, right down to the way EQ would have been used," continues Emerick. "There's been a couple of occasions where I tried adding a little high top, but each time I've taken it off again because it sounded wrong and put things out of balance. The EQ we used in those days was pretty basic. It was just top and bass, and the top end probably peaked at around 5k."

The only modern equipment used were the speakers — Emerick mixed exclusively on Meyer HD-1 nearfields. Multitrack tape machines were all old Studer A80's, and the songs were mastered to A80 1/2-inch. Reinstating the original tube tape machines was considered both unnecessary, as well as a logistics nightmare.

RE-CREATING THE PAST

As far as reverb was concerned, George Martin was equally insistent



PAUL MCCARTNEY: "It's quite weird sitting in Abbey Road's number two studio, where we always worked, listening to what we did when we were 20."

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THE BEATLES

BACK TO ABBEY ROAD

that he didn't want to use any digital reverb or echo plates, "I wanted an echo chamber like we used to use, which of course the studio no longer had." This wasn't strictly true, and it turned out there was still an old chamber in existence, which was used to store echo plates.

Rather fortuitously, this was the No. 2 chamber that would originally have been hooked up to Studio 2. All that remained, however, were the four walls — the rest had to be reinstated by Abbey Road's engineers from memory as best they could.

"Putting back amps, speakers and mics wasn't too much of a problem because we still had quite a lot of the stuff here," explains Allan Rouse. "But the main difficulty was replacing the old glazed sewage pipes that acted as acoustic reflectors and gave the chamber its characteristic sound. In the end we managed to locate some that were the same size, but they weren't glazed and didn't produce the same effect. So we ended up painting them with a high-gloss finish and also tiling some of the chamber, which got us back pretty close to the original."

"The decay time was probably a fraction shorter," says Emerick, "but the overall quality was exactly the same. It gives a color to the vocals that is unique — it's that old EMI Number 2 sound. We also used the old STEED echo, which is basically a tape delay into the chamber, and we used varispeed to re-create the head gap that would have existed on the old BTR tape machines."

MASTER PLAN

Regarding the original master tapes, their condition was remarkable and Emerick was astonished that they played so well after so many years.

"The masters are in amazing condition — there's no shedding, sticky edits or anything. It's incredible to think that some of these haven't been out of their boxes basically for 30-odd years, and they play absolutely perfectly. It certainly says something for EMI tape!

"Because we were using 1-inch 4-track in the early days, the width of the



tape means the quality is excellent with virtually no noise. Also, because we were using all tube equipment, the sound is really incredible. By modern-day standards, the actual quality of the bass and drums and things is wonderful, and I don't think you'd be able to match it today."

Working on the old material again was a bizarre experience for Emerick who confesses that it was difficult at times to become detached from it. "It was really strange to hear all those old tapes again with my announcements on them and all the studio chat — it really took me right back to the sessions. It was actually quite a shock to be mixing all this classic stuff again, and I found it quite difficult to divorce myself from what they are. It's a bit

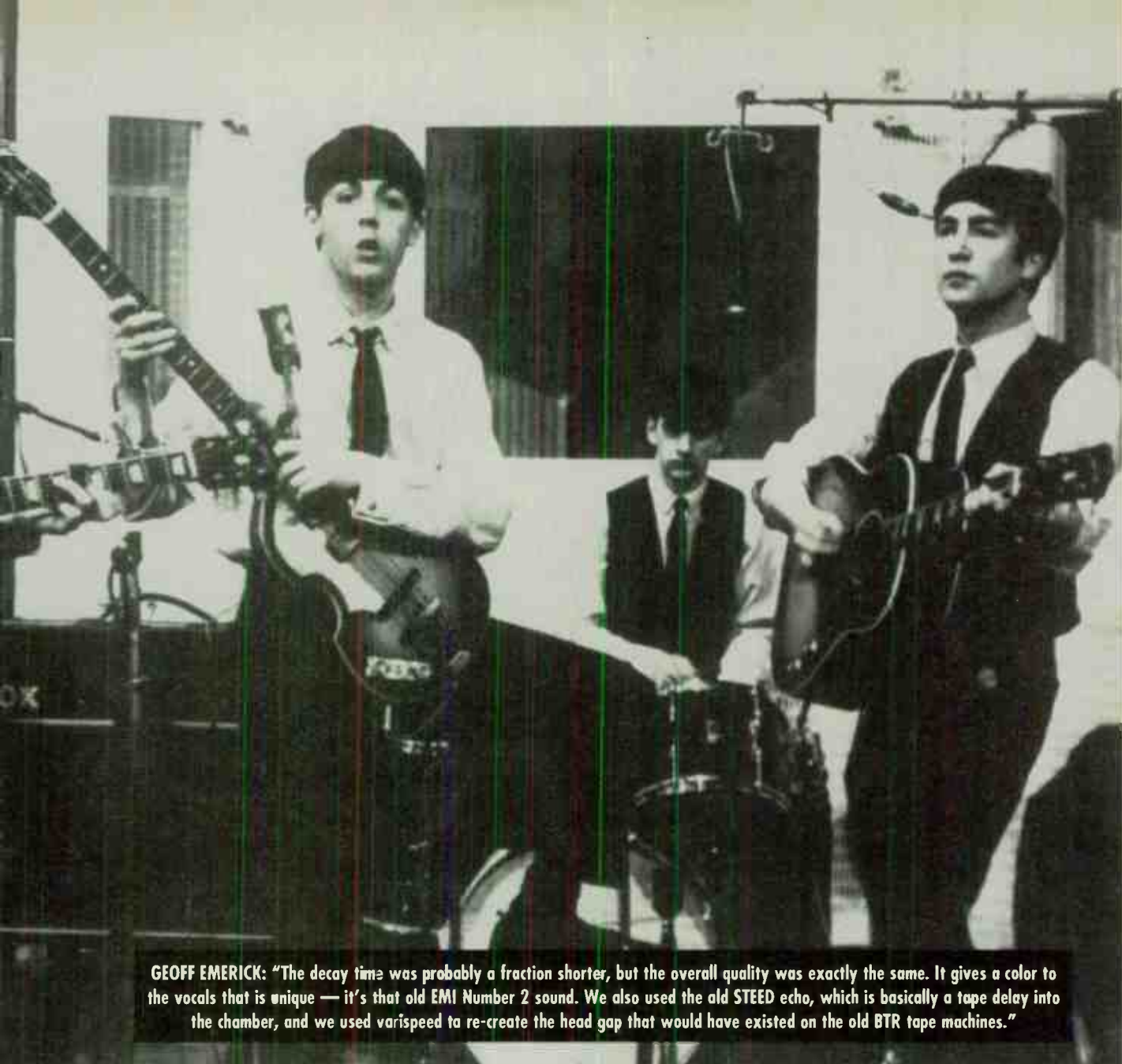


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GEOFF EMERICK: "The decay time was probably a fraction shorter, but the overall quality was exactly the same. It gives a color to the vocals that is unique — it's that old EMI Number 2 sound. We also used the old STEED echo, which is basically a tape delay into the chamber, and we used varispeed to re-create the head gap that would have existed on the old BTR tape machines."

like going into Tutankhamen's tomb and being overawed by all these priceless treasures, and feeling nervous to touch them. It's really weird."

Wherever possible things have been left as they were recorded, "unvarnished" as George Martin refers to it. But on one or two occasions Martin admits that he has "played God" and altered things, but purely to give people something more interesting to listen to.

"With 'Day In The Life,' for example, there's a wonderful, wonderful version that John does — it's either take 1 or take 2 — where he's not trying, he's just singing for himself and it's absolutely lovely — the John that I knew so well. The only problem is that there's no vocal for the middle eight,

the 'Got up, got out of bed, dragged a comb across my head...' section. But luckily I also came across a remix that we did of the middle with Paul singing, which I was able to edit in. The track is completely different from the 'Day in The Life' on *Sgt Pepper*, but it's worth hearing and I believe we were justified in doing it that way."

Generally speaking, mixes have been reasonably quick, probably taking no longer than they did originally — the earlier 4-track recordings being the fastest. "I'd say we're mixing quickly," says Martin. "Of course, you have to remember that the way we used to record in those days, we actually shaped the mix as we recorded it. It wasn't a case of laying down tracks and assembling them later, we used to

record pretty well live, and it's not so much a mixing job as toning. Some of the later songs, though, are more complicated, and on one mix, where we had originally bounced between 4-track machines, I reassembled all the tracks, which came to 16, and that took about a day to do."

NOTHING LIKE THE REAL THING

Martin has been keen that the new albums should give a real impression of what it was like being in the studio with the Beatles, and has included bits and pieces of talking before and after takes, some false starts and so on. "I decided we should be lifting the lid on the boys and let people hear how they were in the studio rather than just hearing the finished, polished produc-

THE BEATLES

BACK TO ABBEY ROAD

tion. Some of the highlights for me are the silly little things where they're just being themselves, breaking into laughter or kidding each other — it's just like being there again. One thing that is quite remarkable though and quite consistent, having listened back to all this material, is just how good the boys were, and it certainly confirms their abilities."

Martin and Emerick still have quite a bit of work to do, and expect to be busy until the end of the year. The CDs will run in chronological order and the first pair (the early days to 1965), are now ready for November release. Each pair will contain roughly 50 songs.

THE NEW SONGS

The two new tracks mentioned earlier are both ballads written by John Lennon that were supplied by Yoko

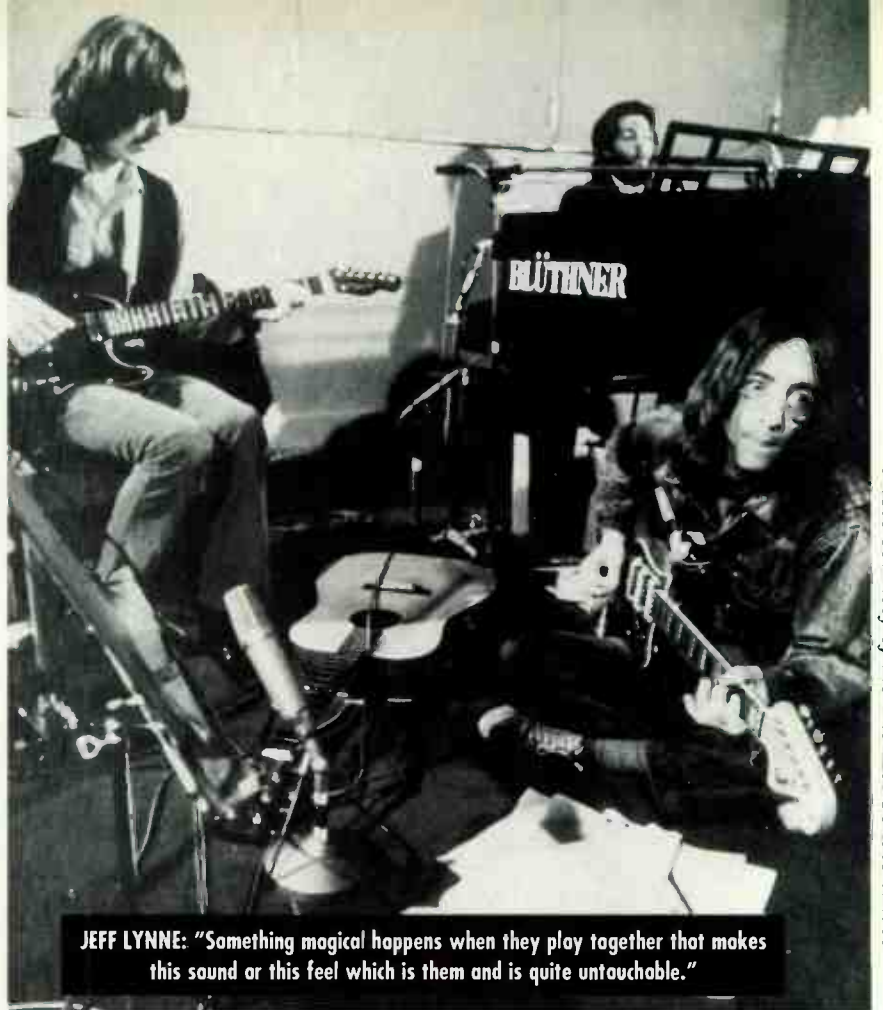


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JEFF LYNNE: "Something magical happens when they play together that makes this sound or this feel which is them and is quite untauchable."

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Ono on a mono cassette demo. Recorded in New York, they feature Lennon singing and playing piano, and formed a base for the other Beatles to dub on to. Amazingly, the first track, ‘Free As A Bird,’ was completed nearly two years ago with very little information leaking out to the press. The second track, ‘Real Love,’ was recorded in February of this year.

Both tracks were recorded and mixed at Paul McCartney’s private studio in East Sussex, and Geoff Emerick was again the engineer. However, a new figure, Jeff Lynne (Idle Race, Move, Electric Light Orchestra, Traveling Wilburys, etc.), was called in to coproduce the project.

“They were the strangest sessions really,” recalls Lynne. “They were the only sessions I’ve ever done where the chat in between takes was so good that I didn’t want to start recording again. There were all these fabulous anecdotes — ‘Remember this and remember that,’ and then one of them would laugh and say, ‘Well, what about you, you bugger!’ As far as I was concerned it was absolute bliss, and the sessions probably took a lot longer because I didn’t say, ‘OK lads, shut up and lets get on with it.’ Instead I’d be going, ‘Oh wow, I didn’t now that,’ it was heaven for me.

“But the thing that really surprised me was how quickly they came together. As soon as they started bashing away it was there — something magical happens when they play together that makes this sound or this feel which is them and is quite untouchable.”

Geoff Emerick was also impressed at how quickly things came together, and also how comfortable the atmosphere was. “We hadn’t seen each other or been together for 25 years, and suddenly we’re all there again working like before. The whole thing just slotted back into place really naturally — there was no distance in time between this session and the last, and it truly felt as though it could have been yesterday. The old magic was there instantly, and as soon as I lifted the faders, there they were — the Beatles. It was amazing, a really fantastic moment.”

Prior to recording, some work was done to clean up the Lennon cassette, although at this stage it’s not completely clear what processes were used except that they were digital. The two tracks were then transferred to analog 24-track.

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Studio Sound, April 1995



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CIRCLE 33 ON FREE INFO CARD



RINGO STARR: "We just pretended that [John] had gone on holiday or out for tea and had left us the tape to play with."

"The quality was never really a problem," says Emerick. "I just looked upon it as John saying, 'Put an effect on my voice to make it sound like this.' It actually sounded like one of those John Lennon vocal sounds with a little bit of wow and flutter and stuff like that, but it worked fine. The balance between vocals and piano also worked out OK and fitted in fine. There were a few occasions, though, where we had to adjust timing, and this was simply done by flying the tape back in."

"Having John playing piano as well as singing was a great thing," notes Lynne. "It kept the integrity and made the whole thing a real performance rather than just having this voice appear out of nowhere."

Apart from the technical aspects of posthumously reuniting Lennon with the other Beatles, there were also emotional ones to consider. According to Ringo a little mental deception was required to keep spirits high. "We just pretended that he'd gone on holiday or out for tea and had left us the tape to play with. That was the only way we could deal with it and get over the hurdle, because it was really very emotional."

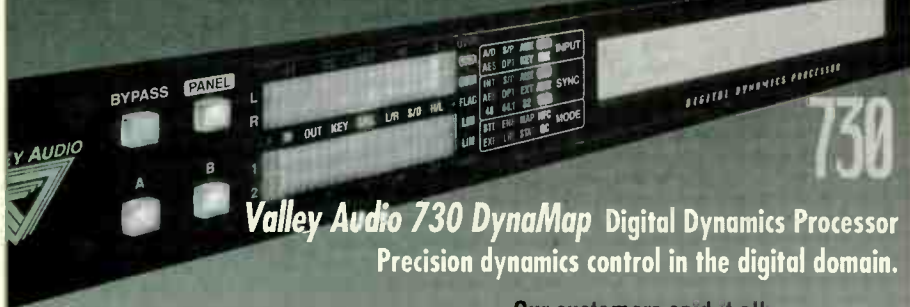
"It was actually exactly the sort of thing he might have done," adds Emerick, "and it was a really good way of thinking about it."

Although the sessions weren't treated in the same way as mixing the archive material, some vintage equipment was used by Emerick including Fairchild limiters and Neumann tube 47 mics for vocals. Original instruments were also used, including a [Holner] violin bass and Ludwig drum kit. Each song was recorded over a four-day period and mixed in a couple of days.

The fact that the three Beatles were back in the studio again for the first time

continued on page 130

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1995

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FIFTH ANNUAL TAKE
ON THE MOST
TREND-SETTING
PRODUCTS ON THE
FLOOR OF THE '95
AES SHOW.**

BLUE RIBBON AWARDS

The recording business has split down the middle — and the middle is gone. If the recent AES in New York was any indication, recording technology has been stretched to the extremes of cost-effective solutions (which we lovingly call the project studio market) and the dream machines (which we scorn as indulgent and old fashioned, mega-buck recording).

What other business would introduce a single, new technology product category (in this case known as digital recording consoles) at a single trade show, with entries 100-times different in pricepoints? It would be as if the IBM PC and the mainframe had been introduced at the very same Comdex, at the very same point of technology development. No way.

Way. It's exactly what happened when two of this year's EQ Blue Ribbon winners, the Yamaha 02R (\$8500) and the Sony Oxford OXF-R3 console (a bargain at \$850,000) made their world debuts. For those of us at the project studio level, the Yamaha board promises to change the world much like the way the ADAT reshuffled the scene upon its introduction. We've already written a great deal about this digital desk, so we'll spare you the reading. The Oxford console, meanwhile, is the type of overindulgent, overengineered, overpriced product that project-studio types like to laugh at, while down deep the gear slut in us can't wait to get our hands on what appears to simply be the most sophisticated digital recording console ever

engineered on the planet. This console ushers in a entirely new 24-bit world for studio junkies like ourselves, and you have to credit the Sony brass with its decision to target its debut at the trickier, fickle world of music recording rather than the broadcast/post market where Sony could have gleamed many more bucks. This is the ultimate English gentleman's console where money was no object — only it was built with Japanese money.

Every other console manufacturer is going to have to start scrambling to find their rightful place in between these audio extremes — and all the solutions are not going to necessarily be digital. As evidence of this fact, we award two more Blue Ribbons to the denizens of the English EQ, which we predict will prevail even as we enter the digital age. John Oram's new console design, the BEQ Series of 8-bus designs, should add some serious console quality to this burgeoning project studio category. The boards are available in 16/24/32-input versions and should fill the gap between the current 8-bus crowd and the higher-priced spreads. Meanwhile, the announcement by Amek chieftain Nick Franks of a product development pact with Fairlight sets a blueprint for cooperation that garnered a major kudo from our staff, combining the expertise that brought the world the first serious digital audio workstation (Fairlight) with the audio passion that has kept Rupert Neve noodling in the analog domain. The result of their new effort is code-named FAME, and, when it comes to



TAKE IT FROM THE TOP: Akai's DR16 hard-disk recorder; Omega's Jaz drive storage device; Fastec's DMT-8 hard-disk recorder; and Panasonic's take on the ADAT — the MDA-1.

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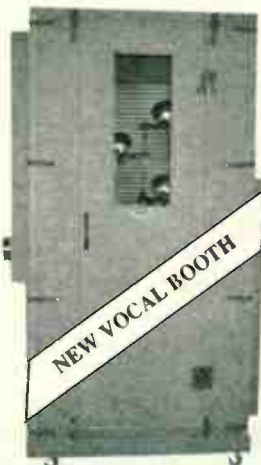
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BLUE RIBBON AWARDS

of random/access record/ edit capability, along with 16 channels of MIDI dynamically automated mix capability. A forthcoming Q1 Super-View VGA board will provide a multipage graphic display of all functions on a VGA monitor. Sure, Fostex's DMT-8 has its shortcomings (it doesn't talk to the outside world), but it sets the stage for a whole series of new, affordable hard-disk recorders for

musicians; this one costs under \$2800. It ain't perfect, but it's something that points toward the next generation of personal recorders/mixers

Also on the "cool stuff" front, we couldn't miss the Nagra ARES-C 16-bit solid-state recorder. Sure it's designed (for now) for broadcast applications, but it's the first commercial use of PCMCIA solid state cards that do not contain any moving parts; these credit-card sized storage devices come in 20 MB (40 minutes) or 64 MB (two hour) configurations.

The Iomega Jaz drive (about \$500)

WHAT'S UP IN STORAGE?

Where have all the 2-inch machines gone? Apparently, they were back at the studio working, but not on the AES exhibition floor. 3M, Ampex, and BASF reported that 2-inch tape sales are still solid (though not spectacular), but the real storage story at Javits was that it is, indeed, a brave new world where data products, optical, and new media alternatives are taking over the scene. Here are the trends:

TREND #1: The hottest storage product on the scene was the 1 GB removable disc from Iomega that Roland will be selling to musicheads at retail and which you'll see buried inside workstations from E-mu and others in months to come. We pick the Jaz drive as the next universal workstation storage medium. Elsewhere on the data side, 3M announced packout deals with Otari (8mm data tape) for its Radar and Fairlight (1.3 GB MO discs) at the show.

TREND #2: Everyone's scrambling to feed the thousands of ADATs and D8's that are flooding the marketplace. BASF is the latest entry, with its Digital Master 938; this company is known for its super-duper long VHS products, so expect some extra-length products soon. Sony, meanwhile, is shipping its popular DARS-116 evaporated tape with its PCM-800; the product is getting a reputation for a smoother tape surface (which translates to longer headlife).

TREND #3: Here come the CD-Rs. Prices are dropping (under \$6 is the current word on the street), and don't be surprised to see them come in half that amount this time next year (ouch!). Ampex introduced a new CD-R line in 63-minute and 74-minute configurations. (3M's CD-Rs are shown below.)

TREND #4: What's next? DAT was a mega-consumer failure that made it big among pros. MiniDisc is next: 1996 will probably be the year when you



start seeing this inexpensive, disposable, pocket-size digital recording media making its move. TASCAM showed a 2-track MiniDisc recorder, and Denon showed a slew of MiniDisc recorders and even a one-to-one replicator for the broadcast and PA markets.

—Martin Porter

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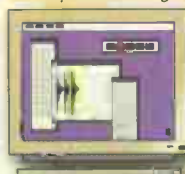
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BLUE RIBBON AWARDS



is worthy of a real world, real need Blue Ribbon; expect to see it interfaced to a digital audio workstation near you real soon. Roland will be selling this fast, portable 1 GB storage cartridge and hard drive at retail. Meanwhile, we also spotted it OEM'ed inside the E-mu Darwin and combined with the Glyph hard drives. Average seek time is 12 milliseconds. Finally, we think, they've come up with the right portable workstation storage medium.

While we're talking about the digital world, a Blue Ribbon goes to Opcode's significant upgrade for Studio Vision Pro, its Macintosh MIDI sequencing software with integrated digital audio recording and editing. Version 3.0 offers audio-to-MIDI/MIDI-to-audio conversion, DSP plugins, intuitive changes in the user interface, and a new mixer with 256-channel capability. It's Pro Tools III compatible, which means it could also get a second Blue Ribbon as part of Digidesign's



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CIRCLE 71 ON FREE INFO CARD

WHATS UP IN LIVE SOUND?

Live sound, the last bastion of the analog world, has been overrun by the digital audio device. The number of digitally controlled or fully digital devices directly targeted at sound reinforcement overwhelmed the trade floor of the AES convention. Not only were digitally controlled live-sound mixers on display, but there also were fully digital audio consoles targeted at live-sound applications.

Although intended for large-scale theater production, the Soundcraft Broadway is a sign of the direction live mixing consoles will be taking in the future. The Broadway, which communicates with a remote audio processing rack via the HCA protocol developed by the Harman Pro Group, is the first major live-sound console to completely separate the audio processing from the control surface. A fully configurable control surface with moving faders and shaft-encoder knobs with LED position indicators offer the operator the ability to control large numbers of input channels by pushing a button instead of reaching or running to the end of a large console.

QSC Audio showed networked power amplifiers and a full line of DSP-based processing and load monitoring under network control. They also displayed the German-built, feature-laden Cantus digital audio console.

Peavey, XTA Electronics, Z-Systems, and many others were showing DSP-based signal processing for everything between the microphone preamp and the power amplifier. The most dramatic shift at this year's AES show was the very low cost of many of these all-in-one processors. The small boxes that offer a legion of processing capabilities in DSP-based products are now within reach of many live-sound operations.

Sure there were analog audio products (even some cool new loudspeakers) at the show, but the features of the latest digital gear caught the most attention.

—Wade McGregor

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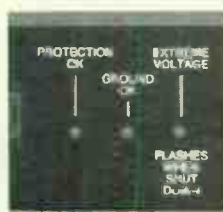
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BLUE RIBBON AWARDS

third-party product development group. TC Tools reverberation package and Focusrite's Red2 Parametric EQ plug-in were particular highlights in this category.

Before we (once again) exit the digital domain, let's take a break to give a much deserved Blue Ribbon to a product that actually debuted at last spring's NAMM, the JBL EON. Once again, you've read enough about this easy-to-use, easy-to-set-up PA, so we're not going to waste ink. Based on the number of manufacturers who are rushing to play catch up, this one still deserves a kudo for doing for the gigging band what TASCAM's Portastudio did for the home recordist.

And while we're lost in no particular-category-at-all land, let's throw a

few more Blue Ribbons out there to some companies that deserve the mention for making our lives interesting:

- Peavey's MediaMatrix Mini-frame 100, for moving in-a-box audio downmarket.
- QSC, for proving that a great amp company can be more than just a great amp company.
- Neutrik for introducing an idea whose time has come — solderless connectors. (Give the same award to John French at JRF for his magnetic head converter.)
- Groove Tubes, for proving that a small, quality company can draw ears for a product like its CL1 compressor.
- Mackie for (finally) delivering the Ultramix Automation package.
- Phil Spector for making this the first TEC Awards in years that our editors wished they hadn't missed. **EO**

WHAT'S UP IN PROJECT STUDIOS?

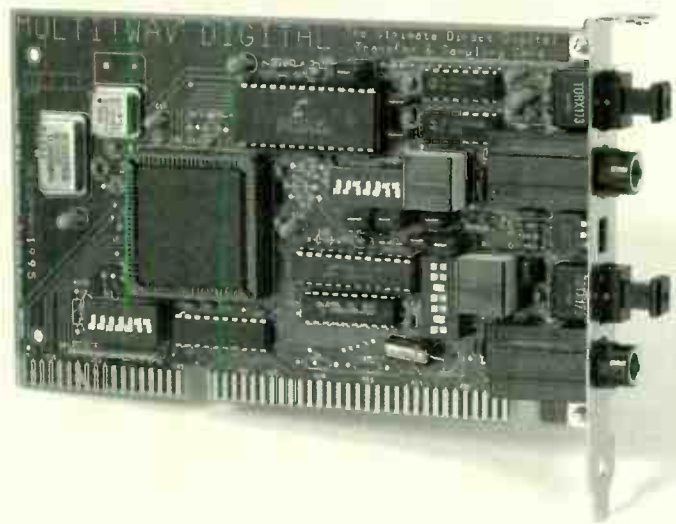
If any diehard, audio curmudgeon still needed convincing that the project studio/live sector is here and here to stay, all he or she had to do was hang at this year's AES. Finally, the project arena became legit. (There even were well-attended workshops on "Maintenance in the Project Studio" and "Out of the Box Audio: Do the New Computers Really Deliver?" on the schedule.) In all, there existed a level of understanding and respect not found before between the commercial and the project environments. Along with a realization that each side can learn from the other, and that each side needs the other to exist. Big-time breakthrough.

Oh yeah, there were products galore for you and me. I'm not just talking products from Messrs. Mackie & Alesis, either (Alesis did have the very cool XT, though; a true second generation of ADAT is here). Allen & Heath, Panasonic/Ramsa, Soundcraft, Peavey, Ensoniq (not on display, but due soon), Spirit, Yamaha, and others all had some serious live and studio consoles to offer. Especially interesting were the entries from Oram Sonics, whose BEQ Series boards are very cool and affordably upscale — a solid step up in features and flexibility. These are "next step" consoles with longevity built in. Accompanying those live boards were stacks of SR speaker systems from EAW, Bag End, Fender, Renkus-Heinz, and Tannoy, among others, manufactured with the idea that touring loudspeakers can be affordable and portable.

And where do you think most of those new tube mic preamps and limiters from TL Audio, Drawmer, Studer(!), Aphex, dbx, etc., that tore up the show are going? The project audience. Audio companies now understand that project folks do lots of sequencing/virtual tracking and generally use only a couple of tracks for acoustic instruments and vocals. So, there's no problem spending a few heavy dollars for two or three excellent preamps and mics.

Finally, AES was loaded with all forms of hard-disk recorder/editors. Akai, Digidesign, Digital Audio Labs, Fostex, SADiE, Soundscape, Spectral, and others (very nice software from 3rd-party folks) all had worthwhile updates to their systems. Systems which will continue to permit us to do quieter, faster, more professional projects — and that's what this is all about. —Hector G. La Torre

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Multi!Wav Digital PRO Features	What you can do with Multi!Wav Digital PRO	Multi!Wav*	CardD*
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► Real-Time Digital Format Conversion	Convert Optical to Coaxial, S/PDIF to AES/EBU, or vice versa, in REAL-TIME!	YES	No
► Software Upgradable Hardware Design	Add NEW HARDWARE features from software updates, such as 24 bit audio & more!	YES	No
► 1/4" Phone Jacks for Coaxial S/PDIF	Multi!Wav uses pressure-contact 1/4" phone jacks. CardD uses single-ended RCA jacks.	PHONE	RCA
► Shielded Digital Audio Transformers	Reduce common-mode noise and clock phase jitter.	YES	No
► Flexible Ground Strapping for Pros & Audiophiles	Achieve optimal ground configuration. Reduce common-mode noise and clock phase jitter.	YES	No
► I/O Overload Protection to 50 VDC	Protect against accidental misconnection of inputs and outputs up to 50 Volts DC.	YES	No
► 256/512 Bit Upgradable RAM FIFO Buffer Option	Improve performance by reducing sensitivity to hardware underruns & overruns.	YES	No
► LC Filtered Analog Supply	Improve receiver PLL performance by reducing noise.	YES	No
► Multi-Layer PCB	Improve performance by reducing "digital" noise.	YES	No
► 24mA Bus Drivers	Meet all IBM PC Bus requirements.	YES	No
► 64 Selectable Addresses	Eliminate hardware installation conflicts.	64	Just 2
► Professional Sample Rates	48kHz, 44.1kHz, 32kHz (software selectable)	YES	Yes
► Life-Time Warranty	Protection against manufacturing defects.	LIFE-TIME	1 Year

* Comparison performed May 1995 using Multi!Wav Digital PRO (rev A) from AdB International and Digital Only CardD (s/n 010099159 rev B) from Digital Audio Labs. Multi!Wav Digital PRO requires one 16-bit ISA bus slot; a computer that meets the hardware requirements specified by your Windows WAV editing software; and digital I/O cables. AdB and Multi!Wav are trademarks of AdB International. All other trademarks are the property of their respective owners. Made in USA.



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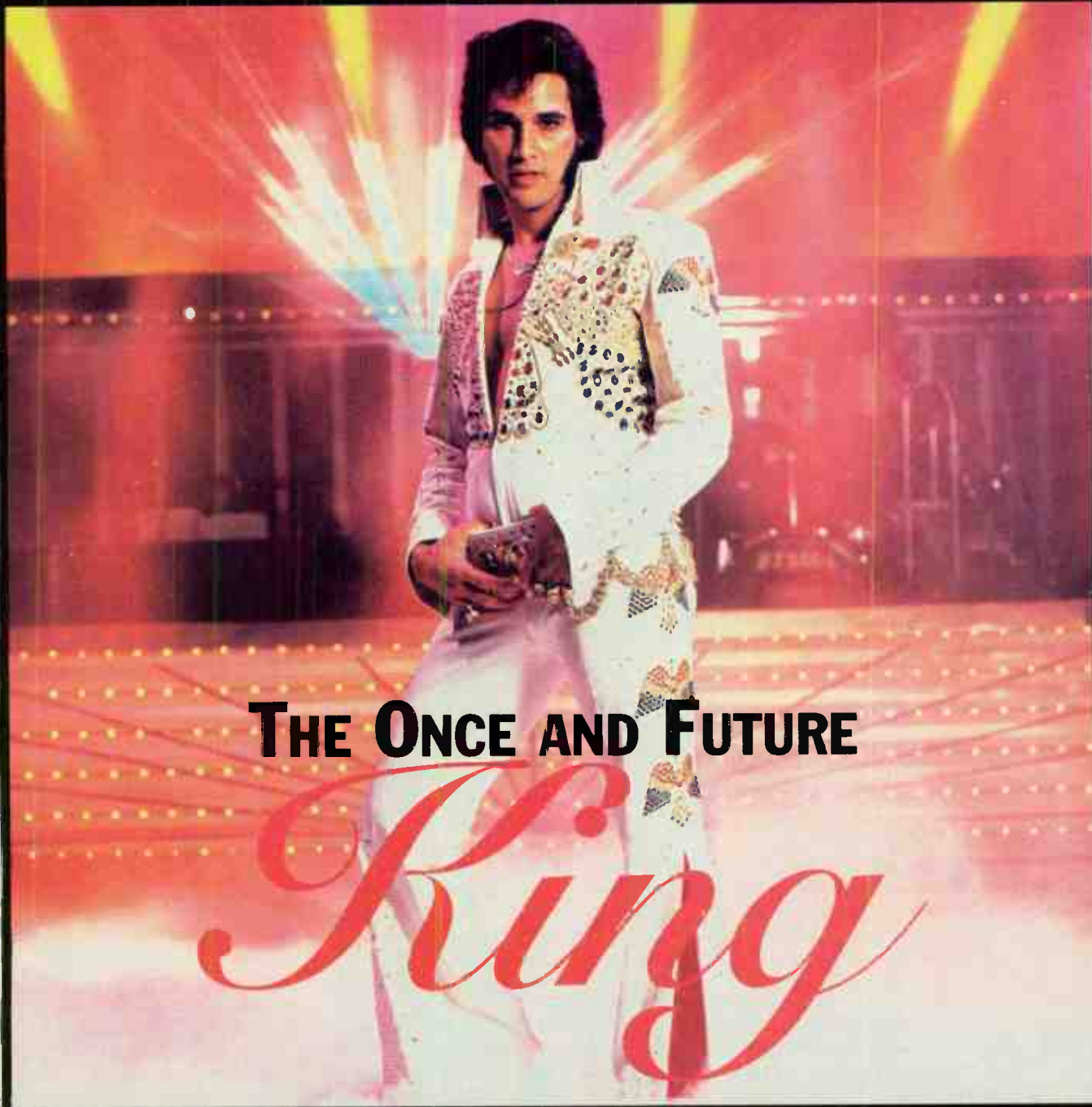
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ELVIS TAKES THE STAGE NIGHTLY IN ATLANTIC CITY WITH THE ASSISTANCE OF A PAIR OF MIDI'D OUT YAMAHA CONSOLES

BY LIANA JONAS

THE RUMORS are true: Elvis is alive. He's been spotted curling his lip at none other than the Material Girl herself, Madonna. He's also been seen gyrating with the likes of Dolly Parton, Tina Turner, Elton John, and the Blues Brothers. If you thought that this could be anything other than professional impersonators, please seek help. Supported by a four-piece band, this talented bunch of performers puts on the famous Legends in Concert show twice a day, six days a week at the 370-seat Park Cabaret at Bally's Park Place Casino Hotel, Atlantic City, NJ. Every facet of the Legends show is performed live

— no lip syncing allowed. Just this past November, the house system was overhauled, and at the center of it all are the Yamaha PM3500 and ProMix 01.

Jim Esher, manager of entertainment, communications and electronics at Bally's Park Place wanted to upgrade the Park Cabaret's old 32-channel system to that of a 40-input system. His primary concerns were having VCA functionality along with a sufficient amount of auxes. Thus the decision to go with the PM3500 console, which is being used for FOH applications, and serves as the overall systems MIDI controller.

With the PM3500's 128

MIDI Mute Group Scenes, the acts of the Legends show are each designated blocks of MIDI Mute Group Scenes containing information on effects settings, cues, and so on. For example, MIDI Mute Scene 1 might be programmed to turn the band members' mics on, while MIDI Mute Scene 2 might be programmed to turn on "Elton John's" vocal mic. At the push of a button, settings are triggered and exactly duplicated show after show, unless otherwise reprogrammed. FOH effects are linked via MIDI to the PM3500 and come in the form of Lexicon reverbs, and Yamaha SPX's and REV7's.

During the planning

stages of the Park Cabaret's new house system, it was decided that the monitors required their own effects, independent from the ones used on the FOH mix. Enter Yamaha's ProMix 01, which is linked to the PM3500. The addition of the ProMix wasn't initially planned by Esher. But when compared to the prices of outboard effects gear, the ProMix offered the necessary effects within the budget at hand. The Park Cabaret uses the ProMix exclusively for monitor mixing and monitor effects via its internal digital processors.

By way of the MIDI link between the two boards, the controlling

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PM3500 transmits MIDI Scene change information to the ProMix. Every time the PM3500 makes a scene change, such as a mic shut-off, it transmits that information to the effects units and to the ProMix. So if, for example, MIDI Mute Group Scene 3 on the PM3500 brings in the background singers, this will trigger Snapshot 2 on the ProMix.

Snapshot 2 on the ProMix might contain information such as compression and reverb parameter settings for the monitor mix.

On the other side of the coin, a transmission from the PM3500 doesn't always trigger a response from the ProMix. For example, MIDI Mute Group Scene 6 may add delay on "Madonna" in the FOH mix, but if there is

no corresponding Snapshot setting on the ProMix programmed, the PM3500 transmission passes on through it. Esher explains, "The PM3500 is the MIDI controller over the FOH and over the ProMix. If there is just an effects change happening in the FOH, it won't affect the ProMix if it's not programmed to respond to the transmission. [ProMix]

will stay the same, and the information will pass on through."

WATCH YOUR BACKUP

It is now pretty evident that the heart of the Legends in Concert show is stored in the PM3500 and ProMix. If you're thinking, "Hey, they should really back this up," you're on the right track. Esher is well aware of the need for program back up. Jim Travis, the FOH engineer uses a PC and Sound Quest's Music Quest software for Windows to store the entire show's MIDI blocks/program material, and it is all downloaded into a laptop that sits at FOH every night. "We save each performer as a block," states Esher, "and that enables us to do different things. For one, it's our safety net should anything go wrong. Also, it serves as a point of reference in case we should need to recall performance material from past shows. For example, if 'Whitney Houston' came back to perform, we go to the PC and download her MIDI blocks into the PM3500 and the ProMix. That's it, she's ready to go."

Another primary reason as to why the PM3500 is used is its stereo matrix system. Four out of the eight matrices have left and right panning for stereo applications. When the Park Cabaret underwent its redesign, Esher designed four different stereo images in the room which coupled perfectly with the PM3500's four stereo matrices. This matrix system being utilized the way it is at the Park Cabaret now has four mono matrices leftover for other applications, such as video feeds. Being in the casino environment, often times television crews come in, and there are four mono matrices for them to plug right into. Esher notes that this is common practice at the Park Cabaret.

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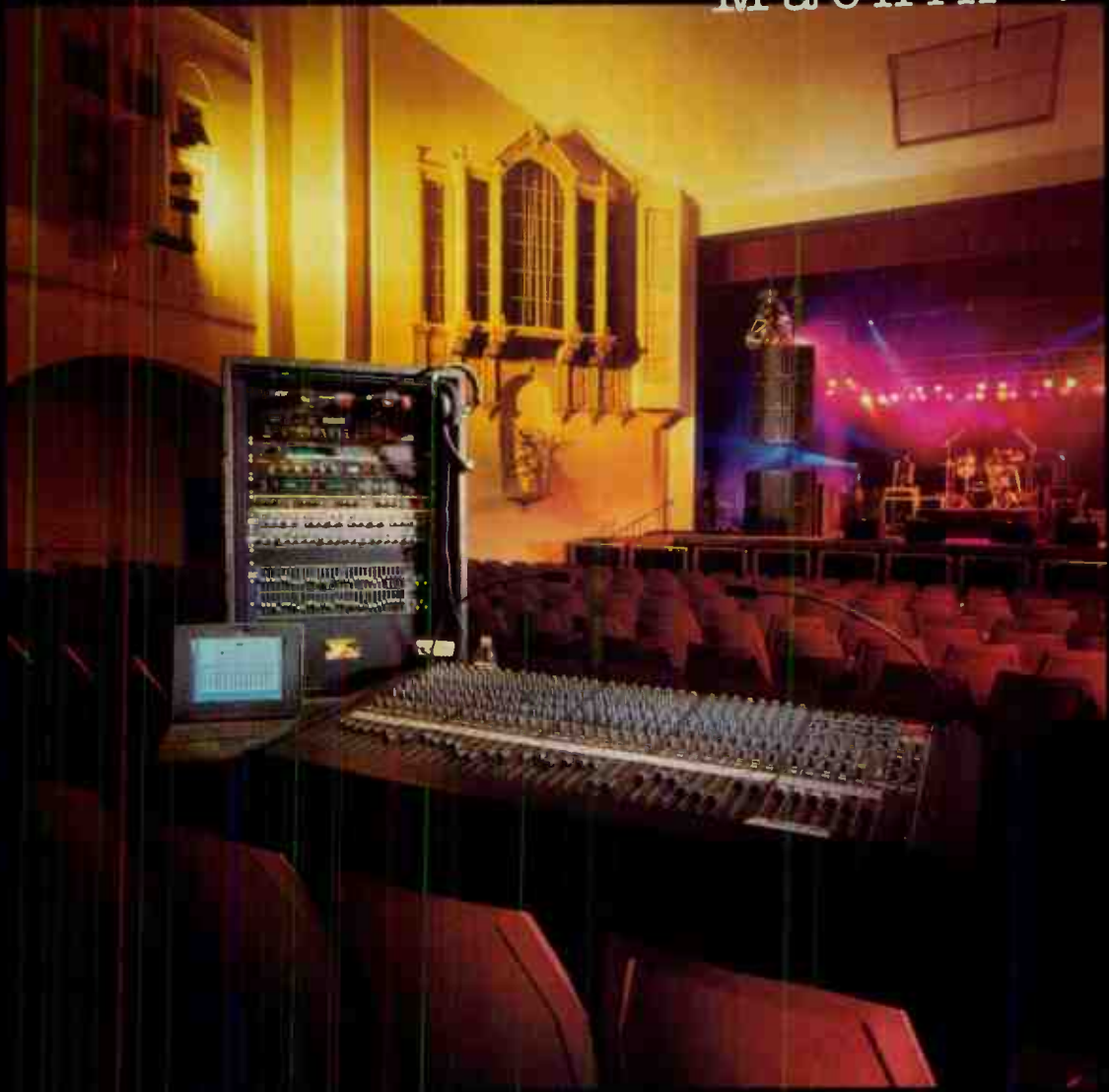
The MX-5200 mixing console system from Fender Pro Audio (available in 16, 24, and 32 input versions, plus options).

*M.S.R.P. for 16 channel version. Does not include applicable local taxes, licenses, or dealer prep charges. Concert rig courtesy of Spectrum Audio. ©1995, F.M.I.C. For more information, send \$2.00 postage and handling to: MX-5200, c/o Fender Pro Audio, 7975 N. Hayden Rd., Scottsdale, AZ 85258.

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The Fender logo is written in its signature white script font on a red rectangular background.

ELECTRONICS



TRIPLE PLAY: AS EASY AS APC

RECORDING and a live show run concurrently at APC Studios in Atlanta, GA. Dubbed "Live X," this concert series showcases up-and-coming acts sponsored by Atlanta alternative radio station WNNX, 99X FM. Some now-famous acts who have graced the stage at APC Studios in a Live X performance are The Jayhawks, Drivin' n' Cryin', the Dave Matthews Band, Bush, and Matthew Sweet. Tickets to Live X are provided free to fans via a contest from WNNX, and the audience never tops 250. Fans can see the bands up close, get autographs, and catch a glimpse of their faves in a most intimate setting. It's a unique experience that is set apart from large venue concerts because no one else is going to see the same show tomorrow.

Live X's are all recorded. Some recordings make it to WNNX's year-end Live X CD compilation, while others get used on artists' albums. An example of this is Dave Matthews Band's cut, "Satellite," which was recorded at a Live X performance and will be released as a CD single. Another



song from the band that was recorded at the same Live X, "Ants Marching," was put into the playlist at WNNX and other radio stations.

Record labels find use for these recordings on a number of levels. Salvatore Nappo, president of APC Studios, explains their

BANDS GET UP CLOSE AND PERSONAL AT APC STUDIOS' LIVE X PERFORMANCES, WHICH ALSO GET SENT OUT OVER THE RADIO AND RELEASED ON DISC

BY LIANA JONAS

value: "It's a totally different environment at a Live X. The approach of going into a studio to produce an album is very different. There, you're building from the ground up, and it takes a lot of time. There's a spontaneity captured at a Live X performance with an intimate audience. The band and audience really feel in touch with one another, and that comes across in the recording. A stereo room mic picks up the audience, and that gets woven into the recording. The energy captured here is much different than that of a large coliseum. And it's different than a band all alone tracking in the studio."

IN THE HOUSE

The house system's speaker stacks at APC studios are a set of custom enclosures with JBL components in them. Each stack consists of a bass scoop with a pair of 15-inch woofers in it, a midrange horn, and a pair of tweeters. Hung high are a set of three-way Electro-Voice speakers. Monitor wedges come in the form of a set of Bullfrogs. Larger monitoring systems are sometimes brought in by the bands if they have specific requirements. Up at the FOH is a 32-channel Studiomaster Series 5 console. Ashley EQs are applied on the FOH, as are Lexicon and Yamaha reverbs, and dbx and Aphex compres-



ON THE FLY: Bush takes the stage (above) as APC staff engineer Chris Downs records their performance.

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THE GEAR IN HERE

A look at what makes a Live X show happen.

FRONT OF HOUSE

Reverbs: Lexicon Alex, LXP-1, and LXP-5; Yamaha SPX90

Delay: Lexicon PCM 41

EQs: Mains — Ashley 3102 Stereo 1/3 Octave [2],
Monitors — dbx 153IX Stereo/Mono [2]

Compressors/Gates: dbx 166A; Aphex 106 [2]

Amplifiers: Peavey CS-800 [2] and CS-1200; Carvin FET 900

CONTROL ROOM A

Console: CAD 64-input with VCA-based automation

Monitors: Yamaha NS-10

Mains: Hardeman Design's Custom Enclosure, room tuning by Bob Hodas

Amplifiers: QSC 1200 & 850

Compressors/Gates: dbx 160X [4] and 166A [4];
Drawmer 1960

Reverbs: Lexicon PCM-70, LXP-15, LXP-1, and LXP-5;
Alesis Quadraverb [2]; Ibanez SDR1000 [2]; Yamaha SPX90

Recorders: Otari MX80 [2]; Ampex 1-inch 8-track; Alesis ADAT [2]; Fostex RD-8 [2]; TASCAM DA-30; Digidesign Pro Tools/Sound Designer; and additional software

Mics: Shure Beta SM57 and 58's; Shure VP88 stereo room mic; AKG C414 [2], D12, and C1000S; CAD Equitek II [2]; Sennheiser 421 [5]; Neumann U89; Electro-Voice P1-20 [6] and RE-20

sors. Monitors receive equalization by way of dbx EQs. Amplification is provided by two Peavey CS-800's, a Peavey CS-1200, and a Carvin FET 900. Monitoring of a Live X is determined on a gig-by-gig basis and by how many cue mixes are required. For the most part, there are two cue mixes coming off of auxes four and five of the FOH Studiomaster board. To capture the sound, a Shure VP88 stereo room mic is positioned twelve feet high and in the middle of the room to pick up the overall room ambience. Shure Beta 57's and 58's are often used throughout for vocal applications. AKG 414's are used to mic guitar amps and the overheads, while Sennheiser 421's are used on toms. An AKG D12 is used on the kick drum.

PREPRODUCTION

The on-the-spot nature of a Live X show and recording requires a lot of preproduction that happens way before the 250 audience members take their seats. Preproduction involves communication between the APC engineers, Nappo, the act, the record label, and band engineers (if being used). Issues commonly addressed during preproduction are: what kind of gear the band is used to on the road, do they want to be seated or stand

up for the performance, the intentions of the recording, does the drummer want to play in a cage, and so on.

DRUMMER UNDER GLASS

APC Studios has a Plexiglas "cage" elevated on a riser that drummers have the option of performing in, and they usually do. For monitoring purposes, headphones are provided. The function of the cage is to prevent leakage to and from the drum kit, and to provide a clean recording. Nappo explains, "The Live X gets recorded onto 2-inch 24-track. The overhead mic alone is all playback of everyone else without the cage. The drummer is still very in touch with what's happening; in fact, there is an audience mic in there for him. Most of the drummers go for this cage because they realize that this is all going to tape, and they know that a recording will outlive a 45-minute show."

Also in the vein of good isolation is placement of the guitar amps. They are positioned approximately 15 feet away, turned outward, canted, and away from the vocal mic, so proximity-wise they are separate from the other stage mics. Nappo admits that, due to the nature of the recording, "We never expect to get totally isolated tracks." Isolating the drums via the cage and getting clean sig-

nals from there puts them way ahead in the isolation game. Further addressing the isolation issue, Nappo tries to have the band keep guitar and bass rig volumes as low as possible without sacrificing their sound. The average level of a Live X show is 85–90 dB. If it's an acoustic act, then the level is obviously less.

THE SUITE SOUNDS OF A

Control Room A (there are two other control rooms) is where the recording is performed at APC Studios by staff engineer Chris Downs. A CAD 64-input analog console with VCA-based automation handles the live recording of the Live X's. Nappo compliments the console for its no-coloration quality, excellent frequency response, and cleanliness. Recording is done on three formats: 2-track DAT, ADAT, and analog 24-track. Control Room A houses two Otari MX80 24-tracks, but a standard Live X only requires about 18 tracks to record on.

"It's very similar to cutting rhythm tracks except for you're doing keepers on vocals," states Nappo. "The other day we had nine tracks on the kit, two on the guitar amps, one for bass, two for vocals, and the room mic."

The stage microphones go directly into a splitter system that divides them between the FOH and Control Room A by way of transformer feeds — another weapon combating noisy tracks. The "monitor" side of the split goes to either a split snake and FOH if a separate monitor console is being operated, or just to the FOH if monitoring is being performed from the FOH console. The APC splitter system allows the FOH to do whatever it likes, without affecting any aspect of the recording.

The majority of Live X performances are backed up on 16 tracks of ADAT. The direct outs on the channels of the CAD board are connected directly to the Otari multitrack. The input chan-



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CIRCLE 92 ON FREE INFO CARD



COMING UP IN OUR DECEMBER ISSUE

...AND JOE MEEK SHALL INHERIT THE EARTH. Who's Joe Meek and why's he getting the earth? He's one of the earliest champions of home recording and the creator of the strange sounds heard on one of the world's first concept albums, *I hear A New World*. From stomping on a bathtub to get a bass sound to self-made compressors, Joe Meek represents the epitome of the bring-it-in-under-budget producers. Learn more about the man and the offbeat manner he worked as *EQ* meets Joe Meek.

HOW SWEDIEN IT IS. Legendary producer/engineer Bruce Swedien talks techniques and tells it like it is. Swedien himself puts pen to paper and discloses the secrets that make him Quincy Jones's and Michael Jackson's favorite knob-twiddler. And speaking of secrets, *EQ* reveals how to get the most from your Kurzweil keyboard.

GIVE THE GIFT OF GEAR. As the holiday season approaches, so does the anxiety that comes from finding the perfect gift for your favorite audio professional. Sure, a subscription to *EQ* and a copy of *EQ on CD* is a nice start, but where do you go from there? *EQ's* Special Gift Buyer's Guide will highlight some of the best pro audio deals this season.

SURVEY SEZ. While our ad guys were out there doing a serious readership survey (ask them for the results), we took our own take on the tried-and-true reader q&a. Back in October, we asked you what you liked and disliked most about the business to which you have dedicated your life. What we received shocked us, and is sure to inform you — not to mention entertain. Find out what goes through a typical *EQ* reader's mind as he or she scours the pages.

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nels on the board get assigned to busses that are fed to the ADATs by way of a TT patchbay. On top of this, for point of reference, a 2-track TASCAM DA-30 DAT mix is running out of the two bus from the CAD board. This gives the people in the control room, record label folk, engineers, and WNNX staff a feel for what is going on. The radio station receives a mixed DAT tape at the completion of a Live X. If the record label chooses to release the show or cuts from the show, a DAT is then sent to a mastering house or is brought straight to press. It all depends on how ready the label feels the tape is. The radio station airs off of the DAT as well.

FOR THE LOVE OF MIC

Nappo reflects for a moment when asked about some technical disasters. "Well, there is one incident that comes to mind. I won't mention the artist's name, but there was a huge difference in the way he attacked the mic at soundcheck and on stage. At soundcheck, he was staying six inches away from the mic, then, during the show, he practically was eating it! He was hurting that mic. The funny thing is that this artist insisted on using this particular mic, which was this old, obscure thing that he had some obvious emotional attachment to. Probably why it had the problems. Anyway, we did a mic switch between songs one and two — a Shure Beta SM57 saved the day. An assistant bolted out to the stage, didn't say a word to the singer, and just switched mics. It was one of the two mic switches that we've ever done at a Live X. At soundcheck we had perfect levels, mic placement, perfect everything. Then during the first song, everything fell apart. But it all worked out in the end." **EQ**

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World Radio History
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CHANGING OF THE GUARD

CBGB'S AUDIO TECH RICHARD DUCKWORTH EXPLAINS THE LEGENDARY CLUB'S SOUND SYSTEM RENOVATION

BY ROBERT GRANGER

FOR THE PAST twenty years, New York's CBGB's has been one of the hottest venues for up-and-coming bands to showcase their original material. One trip to the backstage area would dispel any doubts you may have regarding the popularity and the rich musical history of the club. A dense layer of both stickered and hand-scrawled names cover the walls, left behind as markers of the bands that have taken the stage.

Among some of those bands who have called CBGB's their home include the Ramones, who honed their three-chord barrages of punk at the small East Village club, and Living Colour, whose eclectic style mirrors the diversity of the club. It is the club's diversity that has helped to contribute to the overall success of CBGB's. Whether it was through its famous Monday night showcases, its infamous Sunday hard-core matinees, or its regular show nights, CBGB's has always hosted and catered to an unmeasurable amount of bands and musical styles. With all this talent and musical diversity, the in-house system has to be ready for anything.

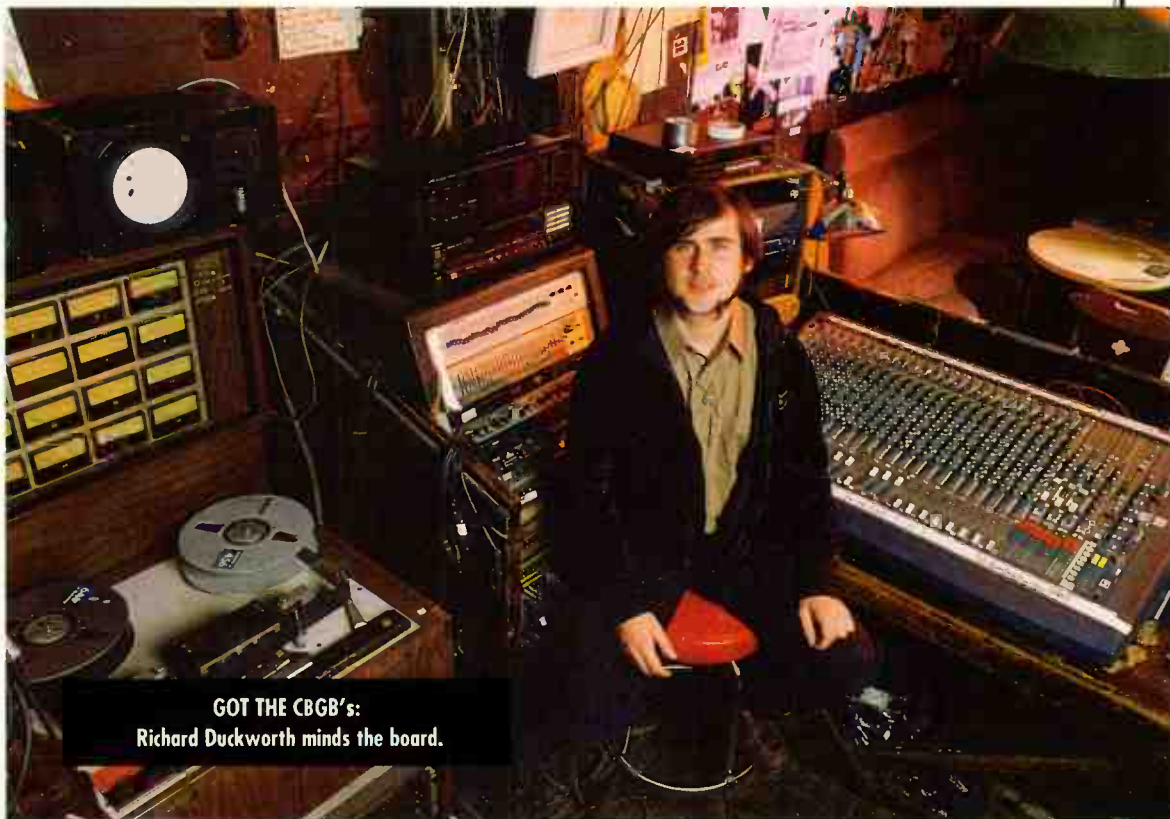
Richard Duckworth has been CBGB's audio technician for the past four years. Over the past few years, Duckworth has been gradually rebuilding and reconditioning pieces of the Norman Dunn-designed, high-end system. "The first thing we did was recone all of our JBL and Electro-Voice speakers. We had a big problem with blowing up horns all the time, so we had to put some protection on those in the form of individual circuits on each horn and driver. From there, we put in a new custom-configured Klark-Teknik crossover and a new Klark-Teknik

graphic EQ. After that, we got the first Soundcraft K3 24-track console installed in the U.S." Too good to trash, CBGB's original Soundcraft Series II console was "retired" to the basement recording/mixing room.

According to Duckworth, the K3 was selected for its sound quality, its modular flexibility, and reliability. "The K3 comes with three different kinds of EQ: there's a line one, then there's a standard one that's kind of like a Soundcraft Delta console, and then they have the theater one. We just got one of the theater modules and it is incredible — it just sounds so good. I had a great time last night because I mixed a show with it and it was so together. Our K3 also has got the automatic muting option, which is a great help in keeping things quiet between sets."

Duckworth also found the choice of subgroups to be a huge benefit of the board. "We've got three subgroups with effects returns controlled on a fader, which is really nice. The fourth subgroup is EQ'd, which gives you another independent EQ for vocals with sweepable mids. I was using it last night to mix a show and it worked out great because sometimes you need that little bit of extra push on a weak vocal to get it out, and this thing works fantastically.

"As far as the board tapes are concerned — we can record them using either a standard Nakamichi MR2 cassette machine that we end up rebuilding every year or a Panasonic SV 3500 DAT machine — you can play around with the tape mix



GOT THE CBGB's:
Richard Duckworth minds the board.

Photos by Julian Jaime

40-INPUT PROBLEM SOLVER.

PERFECT FOR KEYBOARDS!

Not every musician starts out needing a line mixer with 16 STEREO channels. But if you're serious about keyboards, sequencing, digital multitrack recording or electronic drumming, you'll be surprised at just how fast you'll grow into a Mackie Designs LM-3204.

Of course, when you consider everything that we packed into the LM-3204, it's a great mixer to start out with, too. You get two studio-quality mic preamplifiers, virtually every feature of our famous CR-1604 (and then some), plus twice the number of line inputs. All for under \$1099 suggested retail.

Same low noise/high headroom gain structure as the CR-1604. Same bottleneck-free mix amp architecture. Same musical-sounding 3-band EQ. And the built-like-a-tank construction quality that's made our mixers legendary on world tours and in 24-hour-a-day production facilities.

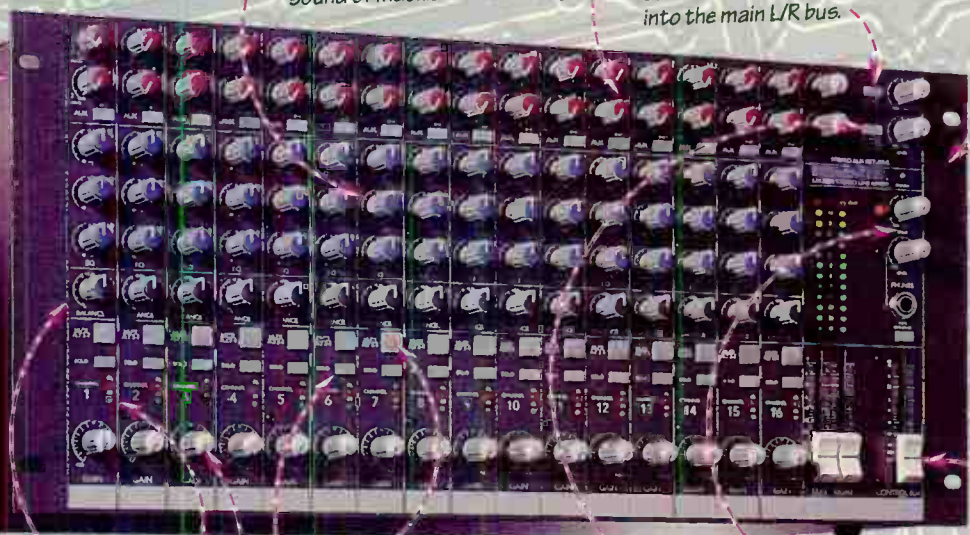
Then we added a Control Room output with its own 45mm fader. Tape Monitor section with both RCA and 1/4" inputs and outputs and even -20dB signal present LEDs on every channel. Then we made the LM-3204 expandable — you can plug in one or more LM-3204Es for 32 or even 48 inputs.

Whether you're looking for a pre-trade instrument or effects submixer, an economical main mixer for a MIDI project studio, or the perfect solution for solo or duo club acts, you've gotta check out the LM-3204. It can make a big impact on your creativity without making a big crater in your equipment budget. Call toll-free today for a free 40-page full line brochure & applications guide.

Sixteen **STEREO CHANNELS** in five rack spaces. Special mix amp architecture prevents overload from multiple hot inputs.

3-BAND EQUALIZATION at 12kHz, 2.5kHz and 80Hz. Others have copied our frequency points, but none have achieved the musical sound of Mackie's EQ circuitry.

4 AUX SENDS per channel (2 accessible at any one time). **ALT 3-4 TO AUX RETURN 3** switch lets you use Alt 3-4 as a stereo submix bus and then remix it back into the main L/R bus.



Stereo **BALANCE** control. Ultra-sensitive **-20dB SIGNAL PRESENT LEDs** give you a constant visual indication of what's on every ch. Overload LEDs, too.

MUTE routes the signal to the **ALT 3-4** stereo bus. Stereo **IN-PLACE SOLO** maintains stereo perspective including effects; also meters individual channel level on 13-LED ladder.

SOLO & HEADPHONE level controls. **AUX RETURN TO CONTROL ROOM** button sends Aux 4 to headphone & monitor buses so you can "wet monitor" or play along with a cue or click feed.

CHANNEL GAIN CONTROL with an extra 15dB of gain **PAST** Unity Gain.

INSIDE: All those goodies that set Mackie apart from the clones... double-sided thru-hole-plated fiberglass main circuit board, gold-plated internal interconnects, exceptionally high RFI rejection input design and much more.

Four **AUX SENDS** (2 stereo & 2 mono) with ultra-high gain. If you're not using effects, the 4 stereo **AUX RETURNS** can also be used as extra stereo inputs.

FINEPRINT: ¹ Suggested retail. Higher in Canada. ² Denotes useage or ownership only, as reported to Mackie Designs, and is in no way intended to represent official endorsement by the individuals or groups mentioned in this ad. ³ When eaten as part of a balanced breakfast.



INPUT for LM-3204E EXPANDER. Basically an LM-3204 without a master section, the LM-3204E adds sixteen stereo channels and four Aux Returns in five rack spaces for \$899¹.

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CIRCLE 75 ON FREE INFO CARD

because the problem with the tapes usually is the vocals are too loud and the guitars are too soft. So you can really push a lot of vocal frequencies in the house mix through the graphic EQ, and then you can pull them back through the board so that you can get a perfect mix in the headphones. It's like six of one, half-a-dozen of another; the mix sounds the same in the house and on the headphones, but they make

a huge difference on the tape, and I really like to give people good tapes.

"For effects right now we're pretty much in heaven. We've got eight aux sends on this new board where we used to only have four. So, basically, after the monitors we've got six over-all sends for effects." This opens up the question of what effects do they usually run? "People usually bring their own effects to a show, but we have a Yamaha

SPX90, SPX90 II, and REV 7; Delta Lab's digital delay; plus a Lexicon LXP-1, which are assignable anywhere because everything is on a patchbay so it's really easy to set up different effects. It's great because you can set up a whole 16-track situation in about ten minutes. You can patch a gate or a compressor anywhere and it goes straight to the board, which also works really well for the off-the-board recording."

The flexibility of the board also comes in quite handy because Duckworth and the crew at CBGB's are not only using it as the house mix console, but they're also using it as the on-air console for the club's radio station, WKDM-AM (see sidebar), and as a recording mixer that feeds the club's basement recording/mixing room. "Basically, the way it works is, upstairs, all the inputs come into the board and then we put all the effects on — the gates and compression and so on — just like any other venue. From there, the board's channel direct outputs feed our custom-built Autotek 2-inch 16-track recorder next to the engineer. This machine is only used for multitrack off-the-board recordings with no gating or effects on the tracks. We use compression only when it's really necessary because producers like to use these really raw tracks and they can take them and manipulate them with their own outboard gear. A second feed (split from the stage) goes downstairs to the recently retired

Soundcraft Series II, which is brought to 32 tracks of ADAT. So you actually need a second engineer when you do an ADAT recording, but the house engineer can do a 2-inch recording from the mix position.

"We mostly do live tracking down in the basement," explains Duckworth. "Sometimes people will come in and bring their own outboard gear because we really don't have a ton of outboard stuff down there. And sometimes we'll bring the stuff down from upstairs because people usually expect really nice Lexicon stuff or even the new Ensoniq DP4 or a Yamaha SPX900 — but all that stuff is really superior to what we have downstairs. But I must say, our effects down there might not be up-to-par, but our tracking is top-notch."

If you've been to CBGB's more than once, you're familiar with the high sound quality of the room. No matter what style of music the band is playing, there is always a great sonic quality and richness to the overall sound. "The whole room is analyzed," explains Duckworth, "and we've got two



UPGRADING THEIR STANDARDS:
Duckworth gets all wired up before a show.

ON THE AIR WITH CBGB'S

Richard Duckworth explains the theory behind CBGB's WKDM-AM.

For the radio broadcast mix, we wanted a situation where we could put a live mix together quickly, and it also had to be something that a broadcast person could handle easily. We wanted the broadcast engineers to be able to get a full multitrack mix together, so there was no point in running a whole mix over. I figured they know music, so we split all the subgroups off the Soundcraft K3 — we give them a drum mix, a bass feed, a guitar/keyboard feed, and then a vocal feed. Then on top of that, they get a mix feed, which has a full mix and a room mic. That's maybe six faders, so it's easier for them to deal with and they can make up their own little mixes and then fly them on the air like, "Hey, let's see what's going on next door." So if there's some really good alternative act playing they can fly right in there on the cuff and it usually sounds *really* good.

WKDM-AM broadcasts from the club for an hour every night, and the signal is actually sent through the phone lines to the broadcast facility, which is currently located in the CBGB Pizza boutique but will soon be moving to CB's gallery. We did some work on that to get the signal really clean and as close to sonically perfect as possible. We really needed some mastering quality-type compression and leveling, so we got an Aphex Compeller, which, for the price, was definitely the best one for the job. I don't think they have a leveler that good at the station because the guy over there said our signal sounded better over the phone than his did at the station!

A lot of the time they'll do live acoustic broadcasts over at the station because it's set up over there with two little Mackie 1604 and 1202 mixers, a Rane DJ mixer that the broadcast people can deal with easily, and a bunch of mics including Shure SM58's and SM57's, an E-V RE 20 and a Sennheiser 421.

"Unplugged" broadcasts are easy because you really don't need much effects and they're usually pretty informal. What they usually do is an unplugged session and then they follow it up with an interview tape. We have both DAT and reel-to-reel at the station, so if they want, they can do everything on DAT, bounce it over to reel-to-reel to edit it, and then fly it out on the air.

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FENDER PX-2216D POWERED MIXER



IT IS JUST YOU, the singer, and a two-door hatchback. You have agreed to do 12 gigs in ten days without any roadies or even a road manager. How are you going to get everything to fit into that little car? And once you get there, how will you get the gear loaded in and set-up in time? This is the time to reconsider every bit of your rig and *minimize*.

If the above scenario is your real life, you are in luck. The creative design team at Fender has developed a mixing system that is built into a carpet-covered wooden case that completely encloses the mixer, effects, and amplifier. Furthermore, the system unfolds into its own sturdy stand. The stand presents the mixing console at a typical working height, while the power amp fits down low, easily accessible but out of the way of the sound mixer. To set up the system,

the user simply removes the protective cover and rotates the mixer out from between the sides of the case. The cover is flipped over and slides into slots within the sides. The mixer then bridges the top of an X formed by sides of the case and the cover. The result is a solid stand and no case lid to stash.

The minimal sound system fits a wide variety of uses — from the club stage where you mix your own house and monitor sound to the A/V presentation that must be ready to go just 10 minutes after you get access to the hotel conference room. If you find that you need speed and flexibility in your setup, then the latest Fender PX-2200 series of 8-, 12-, and 16-channel powered mixers may be just what you need.

The PX-2216D model reviewed here has 16 input channels with XLRs for the actively balanced mic

inputs (with globally switchable 48-volt phantom power) and actively-balanced 1/4-inch-phone jacks for line inputs. Each channel has three bands of EQ (see fig. 1) and four sends. Two sends are pre-

fader and labeled “Monitors,” and the other two are postfader and labeled “Effects” (there is an on-board digital effects unit) and “Auxiliary.” A soldering iron is all that is needed to change any of these sends’

ROAD TEST

MANUFACTURER: Fender Musical Instruments Corporation, 7975 North Hayden Road, Scottsdale, AZ 85258. Tel: 602-596-9690.

APPLICATIONS: Everything but the loudspeakers, mics, and cables for live sound-reinforcement applications.

SUMMARY: A novel package that is well-integrated, easily operated, and features well-built components.

STRENGTHS: A good-sized power amplifier; flexible patching; clean layout of color-coded controls; quick to setup.

WEAKNESSES: Slightly awkward to carry; 1/4-inch phone jacks for amp output connectors.

PRICE: 16-channel version (as reviewed), \$2389.99; 12-channel version, \$2169.99; 8-channel version, \$1949.99

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BY WADE MCGREGOR

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Take a look at your current rack of power amplifiers, or for that matter, most of the amps at your local dealer. They're using oversized, linear power supplies and circuit topology that was developed from the old transistor application hand books of the early 60's.

Our engineering staff, most of whom have lugged these same overweight power amplifiers on gigs for way too many years, decided it was time to drag power amp technology into the 90's.

The result is our Megatech™ switch mode power supply technology. This is not some fragile, up-graded computer supply either. We developed a proprietary, full bridge, digital power supply utilizing hand wound toroidal transformers, and high speed MOSFETs switching at over 100kHz clock speeds. 200 Volt storage capacitors provide extended duration high current output ensuring maximum performance in even the most demanding applications.

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Most amplifiers use an inefficient single high voltage supply which is only fully utilized during peak output power. During most of the duty cycle the extra supply voltage dropped across the output transistors is wasted as excess heat. This reduces the amplifier's ability to perform in extreme conditions, as well as making you pay for (and carry) oversized heatsinks.

The MTA1200's Class H amplifier design enables maximum thermal efficiency by utilizing our Cool Rail™ dual voltage supply technology. Cool Rail™ allows the MTA1200 to run on ±40VDC supply rails for most of the duty cycle, dynamically switching to a high current ±80VDC rail during peak output. Cool Rail's™ benefits to you are lower heat dissipation, compact design, and lower cost.

Our factory computer tests each FR4 fiberglass PCB subassembly. After the top goes on, each MTA1200 is subjected to QC function tests, vibration hardening, burn in, and a critical audio check before shipment. Our final step is an Audio Precision® pedigree, verifying frequency response, THD + N, and power output of each hand crafted amplifier.

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* OK, it does weigh 17 1/2 lbs.
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1200 Watts	800 Watts	600 Watts	400 Watts	275 Watts

* 1 kHz, 1% THD, **20Hz - 20 kHz, .05% THD

World Radio History

MANUFACTURER'S SPECIFICATIONS

MIXER SECTION

Frequency Response: 20 Hz–40 kHz, ± 1 dB

Distortion: Greater than 0.25%, 20 Hz–20 kHz (mic input to any line output)

Signal-to-Noise Ratio: Greater than 90 dBu relative +4 dBu, all channels at unity gain

Maximum Output Level: +22 dBu

Maximum Gain: +84 dB, mic input to main output

Dynamic Range: 116 dB, 20 Hz–20 kHz

Adjacent Channel Crosstalk: -85 dB

Mic Input Gain: 48 dB

Channel Fader Gain: 10 dB

Channel Fader Attenuation: 106 dB

Input Channels: 16

Stereo Inputs: Effects Return, Aux Return, Tape Playback

AMPLIFIER SECTION

Output Power: 300 Watts @ 4 ohms; 150 Watts RMS @ 8 ohms, both channels driven

Power Bandwidth: 10 Hz–68 kHz

Frequency Response: 5 Hz–68 kHz @ rated power into 8-ohm load

Slew Rate: Greater than 13.5 volt per microsecond

Total Harmonic Distortion: Less than 0.03% @ rated power into 4-ohm load, 20 Hz–20 kHz

Hum and Noise: 95 dB below rated power, 20 Hz–20 kHz bandwidth, 102 dB IEC A-Weighted

Damping Factor: Greater than 30, 5 Hz–20 kHz into 8-ohm load, greater than 175 @ 1 kHz

Input Impedance: 33 kohms

Channel Separation: Greater than 65 dB @ 1 kHz

Input Sensitivity: 1.8 dBV for rated power @ 1 kHz

pre/post status. There are also RCA connectors for a stereo tape deck with level controls for both record send (parallel with the master output) and playback (to the main outputs).

The top-mounted connector panel includes a patchbay (unbalanced 1/4-inch phone jacks) with access to the main outputs, auxiliary, effects, and monitor sends, in addition to the I/O of the digital effects, dual 9-band graphic EQ, and the 2-channel power amplifier. This offers many creative patching possibilities — for example, shaping the sound of the lead vocal mic with one of the internal graphic EQs (inserts are

provided on all 16 inputs).

The power amplifier is of the same design as the Fender SPL-9000 I reviewed in *EQ*'s June 1993 issue, but reconfigured to fit into this practical case. The loudspeaker outputs connectors are 1/4-inch phone jack output connectors. These all-too-common connectors are my least favorite for this application. The amplifier's cooling fan might be intrusive at a poetry reading, but probably inaudible in a typical nightclub. The power amp and the mixer's power supply are mounted on the lower section of the panel that forms legs for the whole package. This keeps your center of gravity low

(entropy is important during live performances) and eliminates the hum that can be induced when power transformers are mounted close to mic input circuitry.

The 10-day AfroCubano Festival at Canada's Banff Centre for the Arts created a perfect opportunity to use the PX-2216D in a variety of situations. The unit proved to be very quick to setup and simple to operate. The festival included large-scale concerts and a number of club-like settings running simultaneously. In the smaller venues we used the PX-2216D for both house and monitor mixing. Some situations required more channels of amplifiers

for a second monitor mix or stereo house mix with stage monitors, but this was easy to patch in from the PX-2216D's well-thought-out connector panel. We even used a PX-2216D for one of the larger systems simply as a power amplifier, which was equally easy to connect, running the amplifier right at its limits for hours without any problems. The on-board digital effects unit won't soon replace my studio effects rack, but it does provide a very functional range of reverb, echoes, and delays with selectable decay/delay time.

The board's 60 mm faders are a little stiff in operation, but they may loosen up after a bit of use. The PX-2216D even includes faders for the mono master and monitor masters. Metering consists of two 12-segment LED displays put right beside the master output faders where they are very easy to keep an eye on. The meters follow the solo buttons or default to left/right output. The EQ Assignment switches, in typical powered-mixer fashion, select which output signal feeds each of the two octave-band graphic equalizers before going on to the amplifiers. The user simply selects Left and Right for driving a stereo house system; Mono and Monitor 1 for driving the house and on-stage monitors; or Monitor 1 and Monitor 2 for driving two channels of on-stage monitors. Each channel is independently switchable, so other combinations — espe-

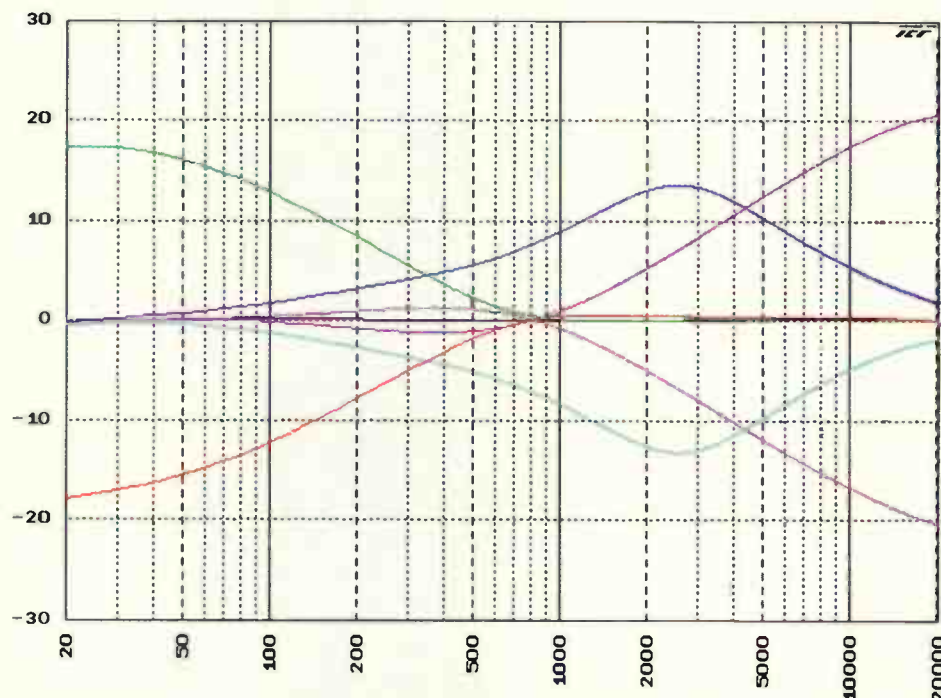


FIGURE 1: Three-band equalization on each input of the PX-2216D offers a large range of boost or cut. All three bands are shown at the extreme + and - settings.

cially with additional channels of amplification — are also possible.

Powered mixers generally suffer from one problem: gain structure. The inclusion of a power amplifier with no input attenuators forces the user to set the overall system level with output level faders. This presents two difficulties if you must operate the unit well below the amplifier's maximum capability (such as using high-efficiency loudspeakers for a low-volume show). First, the master/monitor faders may end up near the bottom of their travel where they have very little resolution. This makes it difficult to accurately make small adjustments in overall level. Second, the one-octave equalizers become the dominant factor limiting the noise floor. In a situation where the full power of the amplifier is not required, the noise this may produce could be noticeable. Thankfully, the PX-2216D is relatively quiet, so this problem may be rare.

The system's 89-page manual includes a complete overview of the unit's operation and a very good introduction to general audio principals, which will be appreciated by entry-level users. Advanced users will be pleased with the concise feature descriptions and the inclusion of complete service schematics.

Although I did find the width of the 16-channel unit made it a little awkward (even for two people) to carry and that the stand can slightly crowd your feet, overall the PX-2216D package is an excellent example of functional form. The complete integration of a durable case makes it likely that the PX-2216D will not only be the fastest system you have ever set up, it may also retain its good looks after hundreds of one-niters!

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FURMAN X-324B ACTIVE CROSSOVER



WHEN YOU finally reach the limits of what conventional passive loudspeaker systems can do, you must use an active crossover — the essential part of a high-efficiency loudspeaker system. Active filter functions are more accurate and offer fewer tradeoffs than those of a comparable passive system. Splitting the frequency bands at line level couples the power amplifier to the loudspeaker driver without any complex passive filter networks getting in the way. The active crossover also provides an important signal-processing stage to optimize the signal sent to each driver in a multiway system.

Furman produces a full range of 24-dB/octave crossovers in the X-Series, providing everything from a very basic two- or three-way crossover to a full four-way, 2-channel unit. The X-324 reviewed here falls into the middle of this range, supplying a full set of crossover features in a single-rack-space unit. I used the X-324 on both two-way and three-way full-range systems, as well as for adding subwoofers to passive full-range loudspeakers. The X-324 can be easily switched between these functions — operating as either a three-way mono or two-way stereo crossover — by sliding a recessed front-panel switch. The unit proved to be both practical and convenient to setup

and use in all of these applications.

COVER UP

The active crossover is an integral part of a loudspeaker system, and needs to be carefully adjusted if the loudspeakers are going to sound good and perform reliably. For users who must share a single crossover model between many different loudspeakers, the X-324 is an especially useful product. For systems such as fixed installations or dedicated crossover/loudspeaker combinations, however, the crossover controls should be as inaccessible as any passive crossover would be (that is, tucked away inside a sealed box). This is possible even when using the X-324 by simply covering it securely. Having said all of that, it is still very common for the crossovers on small-to-medium-sized touring systems to be fully accessible to the operator. What power!

Crossover frequencies are selected on the X-324 with rotary front-panel controls that vary between 35 Hz and 700 Hz or 350 Hz and 7500 Hz depending on the position of the recessed slide switch marked "X10." This is a switch that has always struck fear into the heart of any sound-system owner whose equipment may be within reach of the careless or uninitiated. This simple switch can shift the frequencies sent to those

fragile little HF-compression drivers right out of their range. Let's say, for instance, you are moving the crossover frequency from a safe 1500 Hz to a diaphragm-shattering 150 Hz. This has been the cause of sudden high-end loss in more than one sound system, as all the high-frequency diaphragms are launched into their phase-plugs and turned to shiny confetti. Furman has not overlooked this problem, and the X10 switches are mounted flush with the front panel so that any operations of the switch must be deliberate. There still are, of course, those people who, just to keep the parts suppliers in business, must try out all the switches while the system is running full tilt.

Above each of the four output level controls are two-color LEDs to indicate the position of the adjacent Mute switch — red, muted; green, operational. These mute buttons are very convenient in confirming the driver status during system setup. Alongside each of the mute buttons is a Polarity Reverse switch for quickly checking on mis-wired loudspeakers. The output level controls vary from Off to +6 dB, with much of the range centered around ± 6 dB. This maximizes the amount of resolution in the pot in the range most often required when balancing between the efficiency of low- and high-frequency drivers. Although it may not be ideal for some subbass applications where up to 20 dB of difference is necessary.

ROAD TEST

MANUFACTURER: Furman Sound, Inc., 30 Rich Street, Greenbrae, CA 94904. Tel: 415-927-1225.

APPLICATIONS: An active crossover for stereo two-way systems or one-channel of a three-way loudspeaker system.

SUMMARY: Versatile crossover with all essential features for nearly any active multiway loudspeaker system.

STRENGTHS: Fourth-order filters; choice of stereo two-way or mono three-way operation; adjustable output limiters; compact 1U size.

WEAKNESSES: Controls may be too accessible for some applications; calibration limited by front-panel legends.

PRICE: \$529 (as reviewed; unbalanced version, \$439)

EQ FREE LIT. #: 127

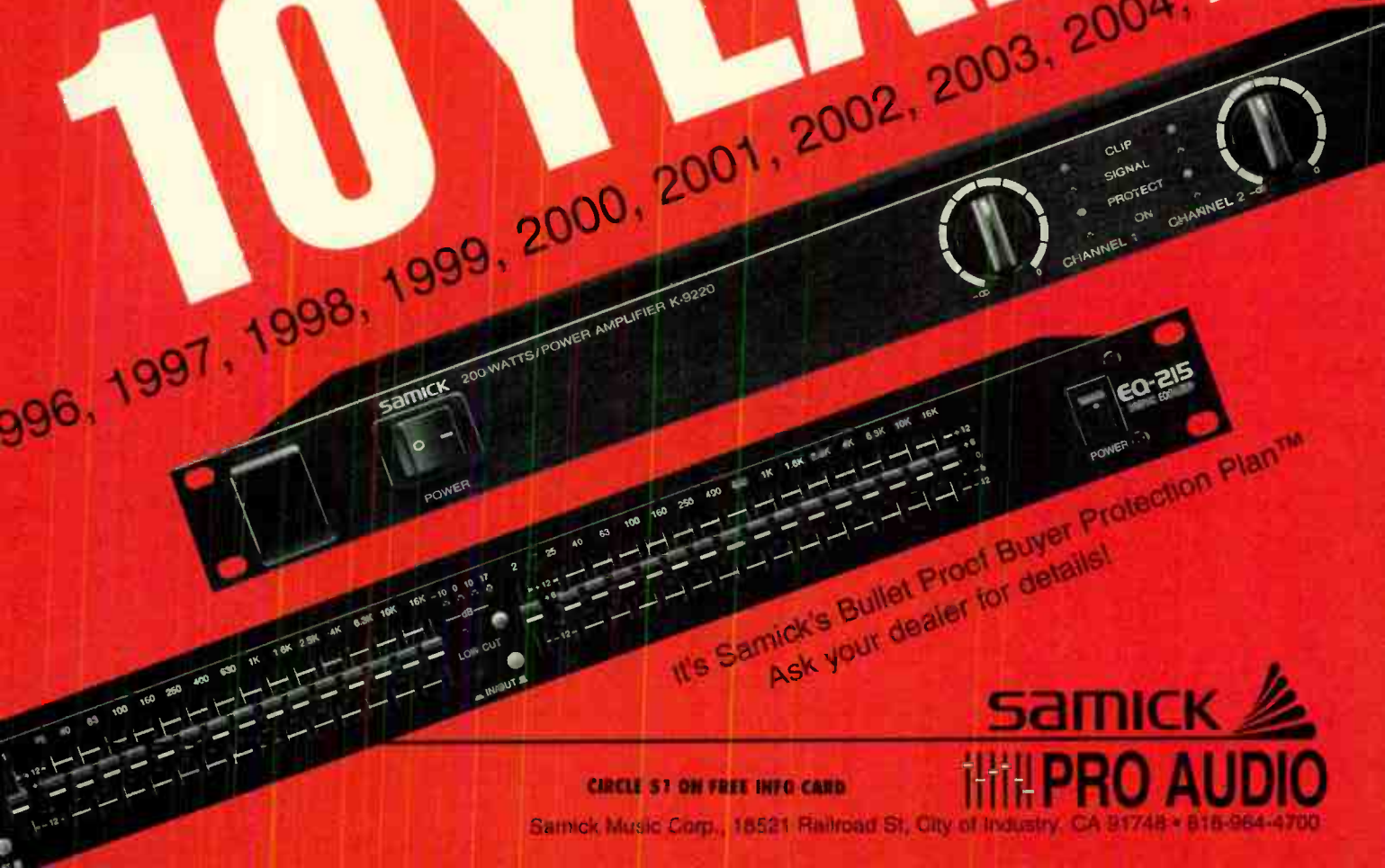
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The X-324 includes switchable high-pass filters on both inputs and independently variable compressors (fixed 4:1 ratio) on each output. Both of these features are accessible from the front panel. I would prefer the output to have much more deliberate limiting (greater than 10:1) available to protect loudspeaker components, but the more modest compression supplied will definitely be less audible when operating above the threshold.

FREEDOM OF CHOICE

A unique (in analog crossovers) feature is the choice of either Linkwitz-Riley or Butterworth 24-dB/octave crossover filters. This is a decision that, like

most crossover parameters, is decided by the loudspeaker design and application. Typically, the Linkwitz-Riley filter types offer smooth frequency response on-axis (-6 dB at crossover) to the loudspeaker, and the Butterworth filters combine to give smooth power response (-3 dB at crossover) through the crossover region. (Power response is the sum of the total energy in all directions produced by the loudspeaker.) The user must then decide where their critical listeners will be (on-axis or off-axis) and adjust this switch accordingly.

There are two more switches for specific applications. Each HF output includes a Horn EQ switch

that provides high-frequency boost to compensate for the natural roll-off of many horn designs (commonly called CD-horn EQ). There is also a Low Sum switch on the rear panel for applications where the X-324 is used to crossover between full-range loudspeakers and subbass loudspeakers. This offers greater efficiency at very low frequencies and prevents out-of-phase LF signals from causing the subs to work too hard for little audible effect. I differ with the X-324 manual, which recommends this switch be used in most stereo sound-reinforcement applications for bass output. I have found that stereo localization can be heard above 100 Hz in some applications, and so this switch

may not be useful on systems that crossover above 150 Hz. The manual covers the X-324, X-424, and X-524, and includes a good overview of crossover applications, clear descriptions of each control function, and complete (if small) schematic diagrams of the entire unit.

Furman has certainly offered users every option they might need in the X-324. Its compact size, actively balanced outputs, ground-lift switch, and cleanly laid out controls provide an easy means for changing settings between different loudspeaker systems. The Furman X-324 seems to have everything for anyone considering an active loudspeaker system.

EQ

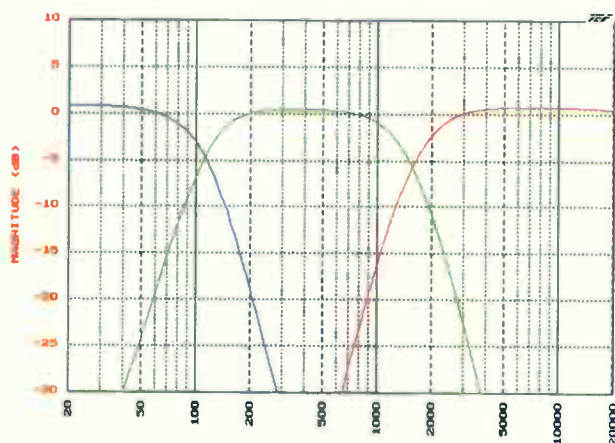


FIGURE 1: Furman X-324 crossover in mono three-way mode with crossover frequencies set to 150 Hz and 1.5 kHz.

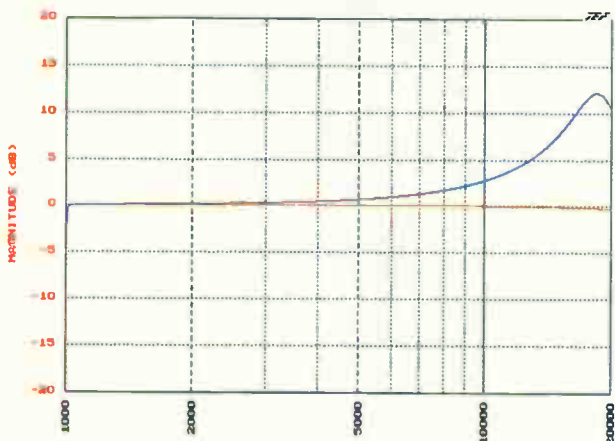


FIGURE 3: High-frequency output response with Horn EQ (blue) and without Horn EQ (red).

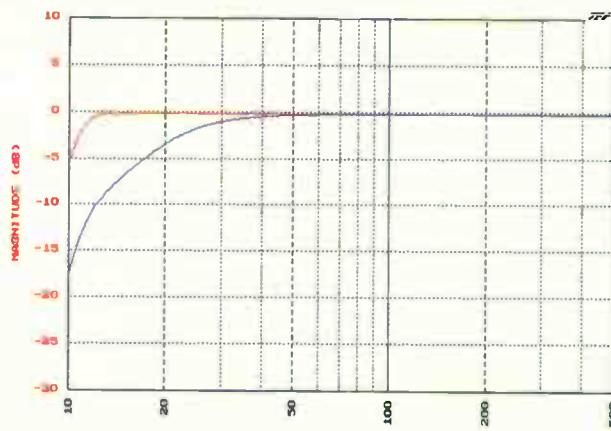


FIGURE 2: Low-frequency output response with high-pass filter (blue) and without high-pass filter (red).

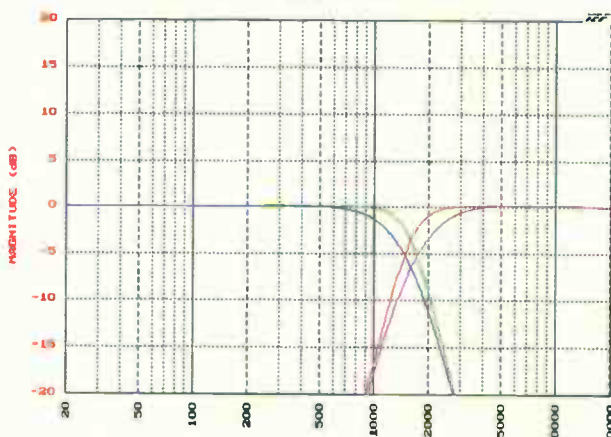
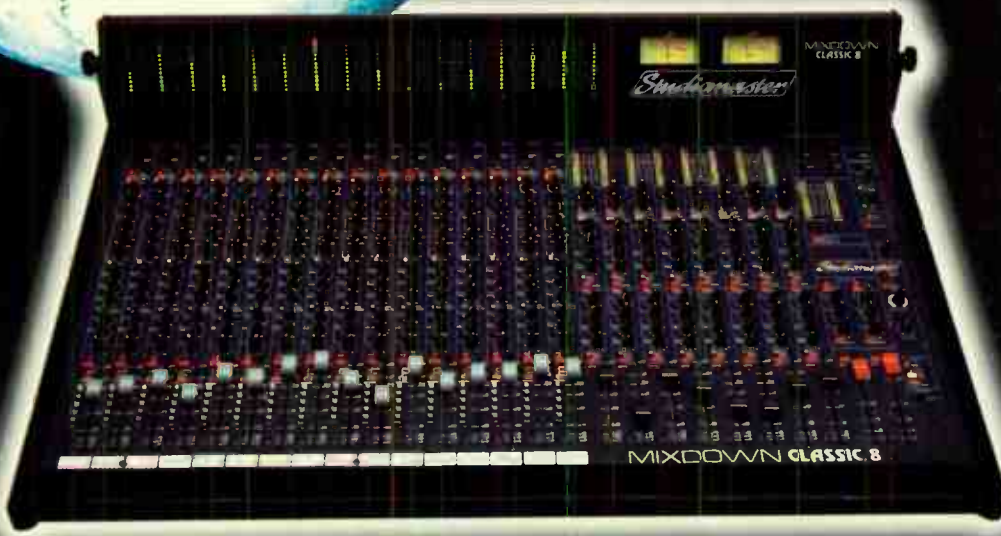


FIGURE 4: Comparison of the two variations of 24 dB/octave filters in the X-324. Green and red traces are Butterworth (-3 dB at crossover) and the blue and violet lines are Linkwitz-Riley (-6 dB at crossover).

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OUTPUT SECTION - The sixteen tape monitors can be used as extra inputs bringing the total number on a 16 channel up to 34. The upper row of inputs even feature two band EQ, PFL, a couple of aux sends and fader reverse. All output groups have insert points. 12 segment bargraphs and 100mm faders. A line up oscillator, stereo return and a built-in talkback mic.

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Soundcraft K1 Console



MANUFACTURER: Soundcraft, 8500 Balboa Blvd., Northridge, CA 91329. Tel: 818-893-4351.

APPLICATION: Professional sound installations and live sound.

SUMMARY: Modular live desk with mono and stereo channel options, 4-band EQ, six auxes, four groups, four output matrix, and LR and mono outputs.

STRENGTHS: Professional feel; no-nonsense quality features; good EQ; stereo module substitution; matrix; undoubtedly robust.

WEAKNESSES: Might be too skimmed down in buzz features for some; doesn't look particularly modern.

PRICE: \$3995 (16-channel version reviewed); 8-channel (rackmount or console version), \$2995; 24-channel, \$5495; 32-channel, \$7695. DCP-100 power supply (8 & 16), \$475; CPS-150 power supply (24 channel), \$620; CPS-450 power supply (32 channel), \$1595. Contact Soundcraft for other available options and accessories.

EQ FREE LIT. #: 128

made from rather than from what it does. It's altogether more utilitarian in construction, using MDF end cheeks and a steel frame rather than lighter alloy. So, while it may be heavier, it's also stronger. It shares the same designers (ex-Neve employees no less) and some electronics with the altogether more expensive K3's — the mic amps, for example, are almost identical. It will undoubtedly appeal to small pro installations and live sound applications with its four groups, main stereo, and mono outputs. All inputs and outputs are balanced aside from unbalanced

THE K SERIES is a new range of live-sound mixers that adopt a very workman-like approach. Topped by the excellent K3 Standard and K3 Theatre variants, the range is pinned down by the K1, which is almost a reaction to the affordable bells and whistles approach. Indeed the K1 could be regarded as something of a Soundcraft 200B for the 1990s with well-chosen features and built-in longevity.

The desk is modular in panels of 4-channels, but with individual channel boards underneath, so this is not a Spirit. Additionally, each block of four can be replaced with a four-strip stereo input block and comes in 16-, 24-, and 32-frame sizes plus an 8-channel rackmount.

While affordable, most of the savings result from what the K1 is

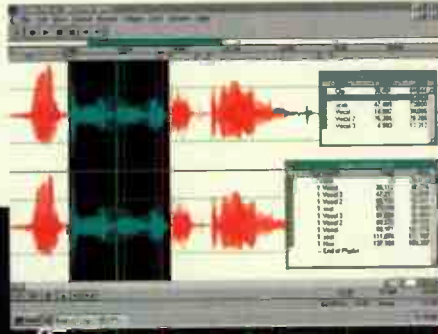


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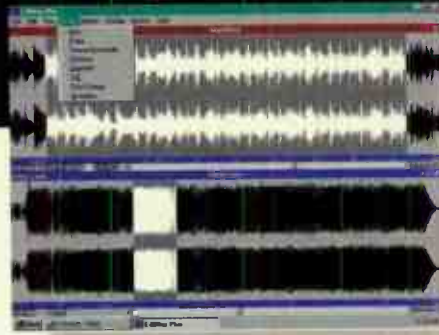


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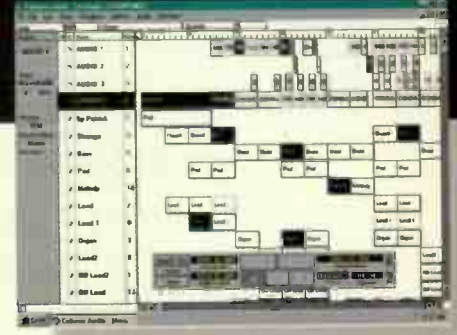
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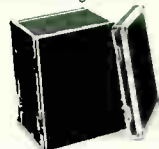


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inserts on channels, groups, and mix outputs plus ground-compensated aux ends. Direct outputs are provided on all channels.

CHANNELS

Mono input modules feature dual-range padless input amps, selectable on a switch, which permit any type of source to be connected via the XLR or standard jack sockets. It's followed by phase reverse, individually switchable phantom power, and an EQ section with bypass that starts with a 100 Hz high-pass filter and takes in fixed HF and LF shelves and two sweepable midrange bands.

Six auxes are accessible from four pots that are switched pre/post in pairs with auxes 3 and 4 switched to address auxes 5 and 6. Routing is to paired groups, the main stereo, and the mono bus independently with peak and signal present LEDs and channel On and PFL buttons.

Rather than the usual token effects returns, K1 comes standard with two full-stereo inputs with routing and switching between two connected pairs of inputs and left leg phase reverse. Input B can be internally jumpered for phono connection.

You get a gain trim, 4-band fixed EQ with a high-pass filter, and a similar aux arrangement with the option of converting auxes 3/4 and 5/6 to true stereo operation through a jumper on the PCB.

GROUPS, MATRIX, AND MASTERS

Groups can either be used as independent outputs or routed to the mono or main outputs in stereo. Each has an AFL. The built-in four-output matrix, which picks up group feeds on

individual pots, has a rotary master, AFL, and allows talkback to each matrix output in addition to metering the matrix on the group output meters. Twelve-segment peak bar-graph metering is also provided for following the main stereo mix and solo signals.

Aux masters have AFLs, talkback can be routed to the mix (nonlatching), and auxes and two 2-track returns with a level pot can be connected and soloed with one routed to the main stereo.

Matters are rounded off by a LR fader and a pot with AFL for the mono output, which can be jumpered to be a mono sum of the stereo output.

IMPRESSIONS

The feel of the K1 is decidedly robust and dependable and reminds us that, while you can buy lots of features in a desk for this sort of money, you can also buy quality. The K1's faders, for example, stay dirt-free by using a right-angle, dust-resistant track, and there's not a hint of pot wobble anywhere. The EQ is good, with loads of control available in the all important low end for live work.

The look of the board might not appeal to everyone's taste as it looks a bit retro compared to other offerings in this price range. Others will prefer this business-like and functional appearance and will appreciate that it is likely to date less quickly than some of the "pastel period" desks that are around at the moment.

This is a well spec'ed desk with sound features — good aux flexibility, a handy matrix, and LR and mono outputs, very useful stereo channels — that will just go on and on.

—Zenon Schoepe

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Low Frequency: 60 Hz, ±15 dB

High-Pass Filter: 12 dB/octave at 100 Hz.



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dbx 290 Reverb



MANUFACTURER: dbx Professional Products, 8760 South Sandy Parkway, Sandy, UT 84070. Tel: 801-566-8800.

SUMMARY: Affordable basic digital reverb with an exceptionally simple operating system.

APPLICATION: Stereo digital reverb for recording and live use, particularly good for vocals, drums, choir, and string sounds.

STRENGTHS: Easiest operating system on the market; high-quality sound; true stereo processing; internal preinput noise gate with adjustable threshold; dedicated reverb decay time control; front-panel adjustable input and output level controls.

WEAKNESSES: No user memory for the storage of custom reverb settings; no LCD display; no dedicated front-panel Bypass switch; no MIDI out or thru.

PRICE: \$399.95

EQ FREE LIT. #: 129

Cathedral, and Gated), and within each type are three different room sizes/shapes (Large, Medium, and Small) and three different preset EQ curves (called "colors"—Dark, Medium, and Bright). There's also a dedicated front-panel reverb decay rotary control that enables you to set the decay time of the selected Type, Size/Shape, and Color. But that's it in terms of editing capabilities. No grids, no menus nested within menus (in fact, there's no display whatsoever!), no assignable controllers, no "power user" features at all. While this will no doubt frustrate those who aspire to the Roger Nichols school of engineering (tweak, tweak, tweak in search of perfection), it will also probably come as a great relief to those who just want a reverb, fast, period.

But even for the most basic application, the 290 provides some major limitations. For one thing, there's no user memory at all, so when you do come up with a reverb setting you like, there's no place to store it (you'll have to instead use good old analog pencil and paper, just like in the bad old days). For another, while there are 54 presets provided (each of the six Types, with each variation Size/Shape and Color), they are only accessible via MIDI program change commands. Speaking of MIDI, to say that the implementation of the 290 is bare-bones would be an understatement. Apart from receiving program change messages (and, at that,

IN MY HUMBLE opinion, every design engineering department at every audio manufacturer in the world should be graced with a sign that reads: "Keep It Simple, Stupid!" (KISS!) After all, the end-users of these products are, by and large, musicians and not engineers, and, while I mean to cast no aspersions on the intelligence level of musicians (after all, I'm one myself), it's clear to me that what the world does *not* need is yet another piece of equipment with an operating system so dense and confusing that months of trial and error (with a thick manual close at hand) are required before it can be mastered.

The engineers at dbx may or may not actually have that sign hanging on their wall, but, happily, they have bucked the trend by actually produc-

ing an uncomplicated, affordable reverb unit that anyone can use moments after taking it out of the box — the 290 stereo digital reverb (part of dbx's Project 1 line of inexpensive signal processors). While the 290's exceptionally simple operating system does not in any way compromise the sound of the unit (which is very good), it does place some limitations in terms of the bells and whistles we've become accustomed to in effects devices.

In this day and age when 400 bucks will buy you the audio equivalent of a Swiss army knife, it's important to understand that the 290 is a reverb unit only, and not a multieffects processor. There are, however, six basic varieties of reverb to choose from (Room, Hall, Chamber, Plate, Cathedral, and Gated), and within



SIMPLY STATED: The engineers at dbx made the 290 reverb easy to use.

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JUST THE SPECS

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- **Six Basic Reverb Effects:** Room, Hall, Chamber, Plate, Cathedral, Gated
- Stereo input/output with independent processors for left and right signals
- Balanced analog I/O (1/4-inch TRS)
- **Nominal Analog Input/Output Level:** +4 dBu, front-panel adjustable
- Front-panel wet/dry control and four-segment LED stereo input level meters
- Footswitch input to place unit in Bypass mode or for Program Up/Down
- MIDI in
- Internal noise gate prereverb input
- **Maximum Delay Memory:** 1.68 seconds
- **A/D and D/A Conversion:** 18-bit PCM
- **Sampling Frequency:** 40 kHz
- **Frequency Response:** 20 Hz to 20 kHz +0, -3 dB
- **S/N Ratio:** Greater than 90 dB; ref = max. signal, 22 kHz measurement bandwidth
- **THD+N:** Less than 0.02% @ 1 kHz
- Single-space 19-inch rack unit
- External "lump-in-line" power supply

only 54 of a possible 128), the only other thing you can do with MIDI is to call up one of 12 preset reverb decay times using continuous controller #1 (modulation wheel). Even then, only data values 1-12 are accepted, and, since these are all at the very bottom end of the range of a modulation wheel (which can output 128 values), it's very difficult to use this in practice. Worse yet, the lack of any kind of front-panel display on the 290 makes it impossible to see which of the 12 decay times is currently selected.

The sound quality of the dbx 290 is certainly good enough to be used in recording applications as well as for live use (there's even an internal prereverb input noise gate provided — with adjustable threshold level — to quiet down hissy inputs during idling). What's

more, a front-panel wet/dry mix control enables the 290 to be connected in either a send/return or direct in/out configuration. In practice, I found the adjustment of the decay control (which seems to operate over quite a broad range) to be critical in setting up optimum reverbs. With some careful twiddling, though, I was able to come up with a number of reverb settings that nicely complemented a variety of vocal styles, ranging from long, breathy tail-offs for ballads (with little digital graininess) to tight, small rooms for hard-edged vocals.

I was also pleasantly surprised to find that the gated "normal" linear Type adds a nice doubling effect, while the "reverse" linear Type produces a kind of gated digital delay effect, with the decay control setting the length of delay. The 290 also excels in producing drum reverbs, with the small room and gated settings providing the best results. The large Cathedral and Chamber settings work well with choir and string sounds, but the preset EQ curves aren't particularly flattering to brass or organ sounds. There's no dedicated front-panel Bypass switch, but you can place the 290 into bypass mode easily enough by pressing and holding down the Room and Chamber reverb Type buttons simultaneously, at which time all LEDs blink to indicate that the unit is in bypass mode. To return to active mode, simply press any front-panel button.

As befits a unit of this simplicity, the owner's manual is all of 16 pages long, containing all relevant information in a readable manner, but lacking any kind of tutorial or reference section.

All in all, the dbx 290 is a unit which I can strongly recommend to anyone looking for a basic yet high-quality reverb at an affordable price.

—Howard Massey

Howard Massey heads up On The Right Wavelength, a MIDI consulting company, as well as Workaday World Productions, a full-service music production studio. He tries to apply the "KISS!" principle to his product reviews, too.

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WorldRadioHistory.com



Drawmer DS201B Noise Gate



MANUFACTURER: Drawmer, Wakefield, UK; distributed in the US by QMI, 25 South Street, Hopkinton, MA 01748. Tel: 508-435-3666.

APPLICATION: All studio and live work.

SUMMARY: Two-channel stereo, linkable, frequency-sensitive noise gate with external keying, and hold control.

STRENGTHS: Superbly variable envelope control; frequency-sensitive triggering; keying; simple to use.

WEAKNESSES: None really, but bet you'll need more than one.

PRICE: \$749

EQ FREE LIT. #: 130

THE BIG DEAL about the Drawmer DS201 noise gate back in 1981 was its frequency sensitivity and the greater envelope control it could exert over a sound by virtue of having attack, hold, and decay pots. It elevated the principle of noise gating above the mundane business of cutting off unwanted noise and injected a creative element into the process.

A gate is triggered to open once an incoming sound exceeds a set threshold; what made, and still makes, the DS201 smart is that high- and low-pass filters can be used to effectively tune to the desired trigger source. As an example of just how effective this can be, you can hang a single mic over a drum kit and tune a DS201 to open the channel only when the snare is hit.

This unit was applied with great effect to gated reverb sounds, and it shone because it had a Hold control for keeping a gate open for a preset time before entering its decay cycle. Other manufactures have copied the frequency-sensitive Drawmer principles, but the DS201 did it first and is still a favorite, many years later.

LET IT B

Improvements in the current DS201B over the original include, balanced connectors as standard; better noise figures through improved components and the use of double sided boards; and the Range has been tweaked as has the attack time which is now a tad faster.

The DS201B features shouldn't, however, be confused with the more advanced features of Drawmer's newer DS301 and DS404 gates, which, among other things, sport hard- and soft-gating functions and represent the modern face of gating. That's not to say that the DS201B isn't advanced, as it's a very able box by any standards and still takes a beating for pure variability.

What you're getting is two stereo, linkable channels of noise gating, each with fully variable threshold, attack, hold, decay, and range, plus high- and low-frequency sweepable filters for setting the frequency-sensitive tuning. Switches flick between bypass, gate, and key listening (for auditioning the filtered signal at the

output), and also change between normal gating operation and ducking (ducks down the DS201B processed signal a preset amount set on the Range pot in response to an incoming key signal). Ducking is generally used by radio DJs who want to talk over music, but it's also a useful effect for blending two signals together automatically when mixing. Finally, the DS201B can be switched to respond to the internal signal or an external source on the rear-panel key input jack socket.

Gate activity is reflected on each channel via three LEDs: red for closed, and green and amber for open, with green extinguishing when signal falls below threshold and amber staying lit for the duration of the envelope decay time.

Stereo operation is switchable wherein Channel 1 sets the master threshold that triggers the envelopes of both channels simultaneously. This is quite handy if you're dealing with a tightly timed track and a sloppy one, such as a kick drum and a bass; you can use the former as the master to tighten up most of the timing drifts of the latter. It's surprising how much difference this can make,

continued on page 130

DS201B SPECS

LF filter: 25 Hz–4 kHz.

HF filter: 250 Hz–35 kHz.

Threshold: variable from –54 dB to infinity

Attack: 10 microseconds to 1 second

Hold: 2 ms to 2 seconds

Decay: 2 ms to 4 seconds

Range: 0 dB to –80 dB



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REVIEW SHORTS

Synclavier S/Link 2.0

"An excellent feature is the ability to audition sound of any format through the built-in Macintosh speaker with no additional hardware!"

Converting 16-bit 44.1 kHz audio files to 8-bit 22 kHz files really hurts my ears, but it's a necessary evil if you're working on multimedia projects. Although nothing can be done about the quality loss when converting your CD-quality audio to play on the computer desktop, Synclavier's S/Link 2.0 (\$249) software for the Macintosh makes it easy to convert digital audio into nearly any format you can imagine.

Files can be converted among Amiga, Atari, Dawn, Digidesign, Doremi, Fostex Foundation, Macintosh, Microsoft Windows, MS-DOS, NeXT, PostPro, Silicon Graphics, SoundBlaster, Sun, and Synclavier hardware. Supported formats include .WAV, SoundEdit, IFF/8SVX, .snd/.au, VOC,

MOD, AIFF, AIFF-C, SND, Sound Designer I, Sound Designer II, Fostex Foundation RPE, Synclavier, PostPro, CD-ROM, CD-Audio, QuickTime and Macintosh Type 1 and 2 sound resources. (Potential users should double-check with hardware manufacturers to ensure that their formats are supported by S/Link.)

S/Link requires a Mac with a FPU (Floating Point Unit math coprocessor chip) or FPU emulation software, Sound Manager 3.0 or later, and System 7.0 or later. It requires less than 2 MB of RAM to run and is Power Macintosh native. S/Link uses a hard-disk authorization method of copy protection and installation is very straightforward.

After starting S/Link, a window similar to the Macintosh Finder appears, but there are numerous differences. For example, S/Link windows have no zoom or close boxes and you cannot drag to make selections. Items cannot be renamed from within S/Link. Files must be organized using the Macintosh Finder. S/Link lists all files and folders and identifies soundfiles with a speaker icon along with sample rate, bit depth, number of channels, file size, format, and compression type.

To convert a soundfile, simply drag it to a different folder. You can create and name new folders within S/Link. A specific region of the sound can be defined for conversion in addition to the destination file format, a bit depth, and sample rate.

Batch conversion is just as easy. Select the source files or folders and drag them to a different folder. All soundfiles in folders, regardless of their type, are converted to the new format.

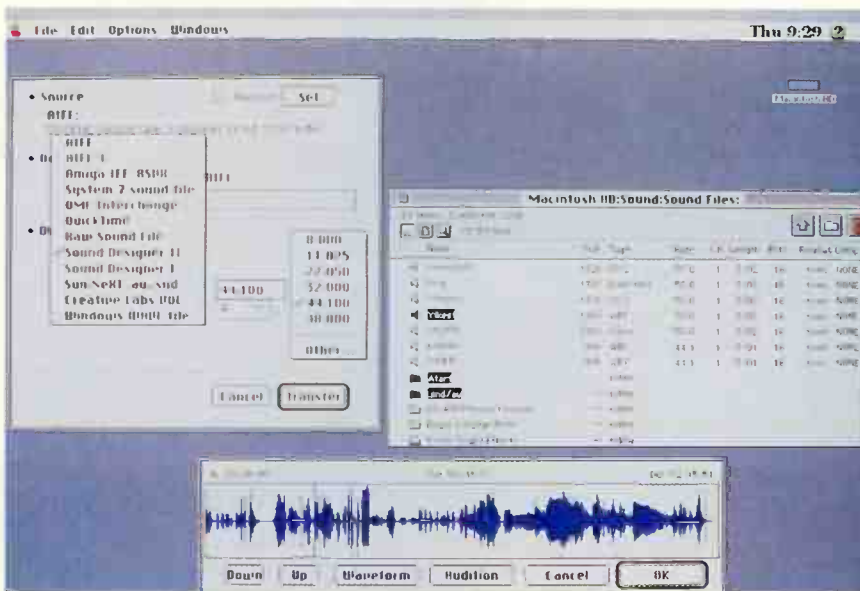
An excellent feature is the ability to audition sound of any format through the built-in Macintosh speaker with no additional hardware! Conversions also require no special audio hardware, so I was able to audition files and translate audio on an older Mac without tying up my Digidesign hardware for hours.

It's possible to audition *any* file as an audio file on the Mac. It was fun to listen to the noises generated by text and PICT files. This review sounded like a typewriter key when played back as an audio file.

I used S/Link to convert audio for a project done entirely in Adobe Premiere. The audio sources included a 48 kHz DAT recording of narration, an original music sequence recorded to a MiniDisc system, sound effects at 44.1 kHz from a CD sound library, and additional sounds recorded in Sound Designer. I found that converting all the audio to QuickTime format saved a substantial amount of compilation time for Premiere to create the final movie.

The quality? Well, to my ears, the conversions were better than what Sound Designer II is capable of, especially when converting to 8 bits. If you do audio for multimedia or need to convert between multiple formats, then S/Link is probably just what you've been looking for.

—Tona Ohama



S/LINK SOFTWARE: Synclavier's S/Link program makes file conversion easy.

For more information, contact The Synclavier Company; Rivermill Complex, Lebanon, NH 03766. Tel: 603-448-8887. Circle EQ free lit. #131.

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Oktava MK219 Mic

Back from the (former)
U.S.S.R., this tube
microphone will have you
saying "Da"

BY ZENON SCHOEPE

Ugly as sin, but make no mistake about it, Oktava's MK219 cardioid condenser has all the makings of the large diaphragm find of the decade. (See *EQ*'s "Microphile," March 1995.) Its finish-quality may not be up to standard and it's presented in the cheapest-looking, foam-filled case you've ever seen, but that's because it's Russian. What arrives at your ears from this original 1960s design sounds not dissimilar in character to far more expensive large-capsule mics of German origin. Indeed the price, \$499 list, may well convince you to live with the cosmetics.

FEATURES: RUSSIAN STYLE

Activity centers around a large gold-plated diaphragm feeding a discrete preamp with magnetic reed switches for a 10 dB pad and a 50 Hz high-pass filter. You get an insubstantial side-mount-style mic holder that is screwed in place by the mic's XLR base connector collar to suit the device's side axis response and a Russian female XLR. The latter is required if you want to be able to click-lock a plug into the mic base, as

a standard Neutrik XLR, while still usable, will not.

The microphone's finish quality is ragged looking, but rugged, and potentially very long-lived, and doesn't compromise its performance. Plug it in and, believe me, you'll forget its looks, because this is a superb vocal mic with natural presence, a wonderful fatness, and that bit of magic that happens when you put a large capsule in a largish head. It's not silent by any stretch of the imagination, but still quiet enough for the majority of applications — particularly when you remember that it's a 30-year-old design.

DRIVING MISS OKTAVA

The Oktava MK219 is adaptable enough to use on acoustic instruments. You can, for example, get a very wholesome, proper acoustic guitar sound out of it. Plus, because it's cheap, you can experiment with it in places such as near drumsticks, where you might not want to risk putting your best large-diaphragm mic.

This mic is best at providing a classy and expensive-sounding vocal. It does so effortlessly, with surprising resistance to popping at reasonable distances. It's not flat and honest, but then neither are many other large-capsule mics, and that factor hasn't harmed their reputations.

You're kidding yourself if you think you're getting a Neumann for peanuts; there are differences that warrant the extra dollars. However, for the money, the MK219 will be close enough for jazz for many. I'd go so far as to say that if the only acoustic recording you do is vocals, then you owe it to yourself to track this mic



Photo by Ed Colver

down. It may be the only mic you'll ever need. Highly recommended.

[Worldwide exporter A.S. McKay, LTD and Western Hemisphere distributor Harris Allied tell *EQ* that, since the original audition of the 219, "very respectable packaging, documentation and craftsmanship, which were a must for broad acceptance in the Western World, are now standard features which complement the 219's legendary sound." —HGL]

The MK219 is distributed in the Western Hemisphere by Harris Allied, 800-622-0022. Circle *EQ* free lit. #133.

HISTORY LESSON

Oktava's factory is in Tula, about 100 km south of Moscow, home of the Russian armaments industry and, most famously, the Kalashnikov. Oktava's history goes back to the beginning of the century and has along the way taken in lightning conductors, radios, speakers, telephone transducers, and, in 1947, the first mics. It's Russia's biggest mic manufacturer by a mile, and peaked at some 5 million units a year under the old regime. Its transducers are also used in the Russian space program.

Pro mic manufacturing actually stopped from lack of demand when the Soviet Bloc collapsed, but was restarted when UK-based, international distributors A.S. McKay spotted the potential of the products in the West and injected funds.

Oktava builds two other mics of interest: the modular MK012 preamp with interchangeable cardioid, hypercardioid, and omni capsules plus a 10 dB pad collar and its latest design, the rather splendid MK011 cardioid condenser.

—Zenon Schoepe

Take it...



1994 Editors' Choice for Best New Mic
ELECTRONIC MUSICIAN MAGAZINE

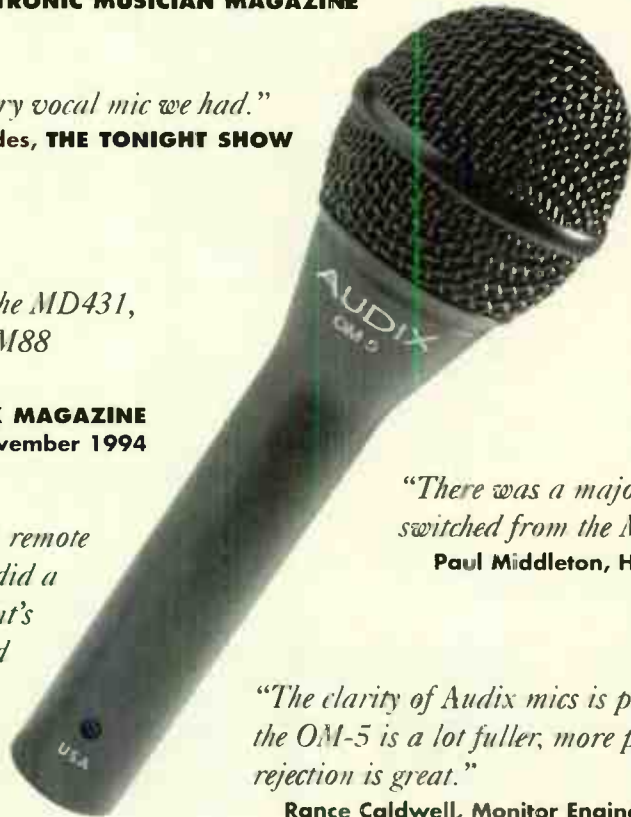
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Bob Whyley & Steve Kades, THE TONIGHT SHOW

"The OM-5 outperformed the MD431, Beta 58, N/DYM857 and M88 for gain before feedback"
Mark Frink, MIX MAGAZINE
November 1994

"At a very crowded and noisy remote held on the street... the OM-5 did a superb job of defining the talent's voice and rejecting background clutter."

RADIO WORLD
February 1995



"The OM-5 is the most significant audio improvement we've made to the show."
John Harris, Audio Engineer,
JON STEWART SHOW

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Paul Middleton, House Engineer for BONNIE RAITT

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Rance Caldwell, Monitor Engineer for CROSBY, STILLS AND NASH

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LETTERS TO EQ

continued from page 8

LET IT PRE

Please pass this note on to Justin Baird who sent in a question about inexpensive microphone preamps in your EQ&A section in the September 1995 issue.

The broadcast industry has many high-quality mic preamps available. I have seen one advertised in broadcast magazines with a small circuit board mounted on the back of a female XLR that sells for \$75. Henery Engineering (Tel: 818-355-3656) also supplies inexpensive preamps. Most of the broadcast supply houses sell Henery Engineering products. A single-channel mic preamp in its matchbox series sells for around \$69. A dual-channel is around \$90. You supply 24 volts to operate it.

These items are available from broadcast supply houses such as Krouse Kimzey (Fort Worth, TX; Tel: 1-800-433-2105) and Broadcast Equipment Sales (Jackson, MS; Tel: 601-857-8573).

A similar product line is called Stick-on, and it sometimes has the distributor's name on it. Markertek Video Supply carries them, and can be reached at 1-800-522-2025 in Saugerties, NY.

*Doug Groenhoff
Chief Operator
KXCI Community Radio
Tucson, AZ*

CORRECTION

Some time ago I submitted a letter in response to something that appeared in an EQ&A column. This month, the October issue of EQ came in the mail, and I found my letter printed ("Among the Converted," pg. 8). Thanks for the pleasant surprise and the consideration. There is, however, an error in your printing that should be brought to your attention. The third paragraph as it reads in your publication states:

"In the digital domain, the audio passes through a pair of D/A converters as it leaves the source machine..."

It should read: *"In the analog domain..."* During a digital transfer, D/A converters are not utilized.

Just thought I'd bring this to your attention.

*Steve Revilak
Boston, MA*

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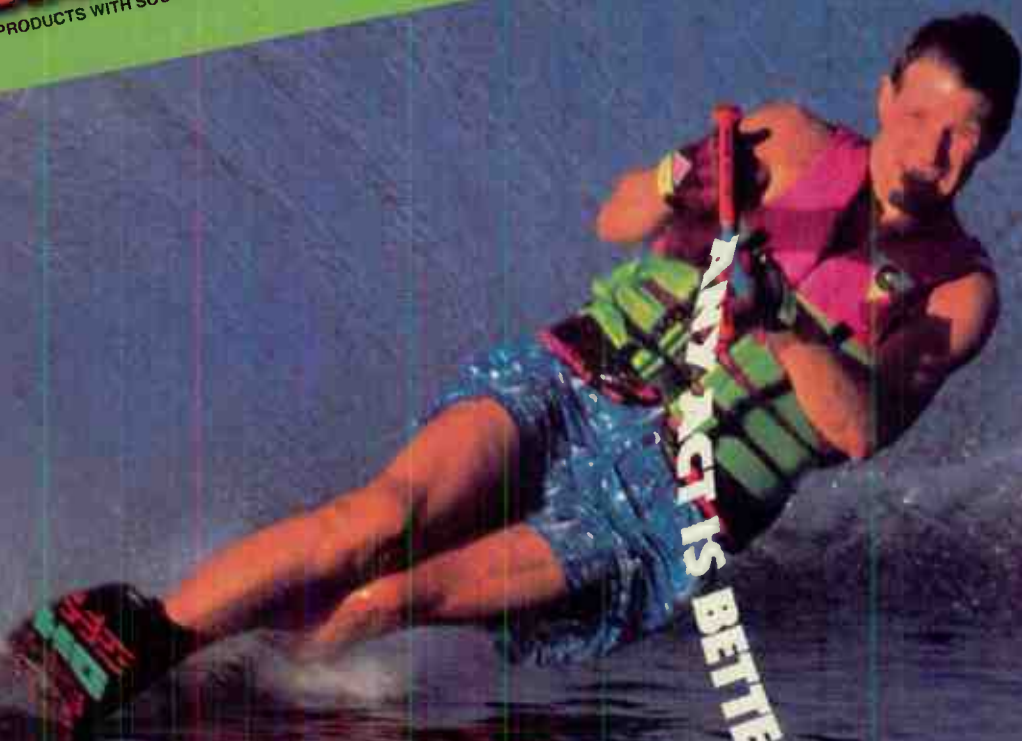
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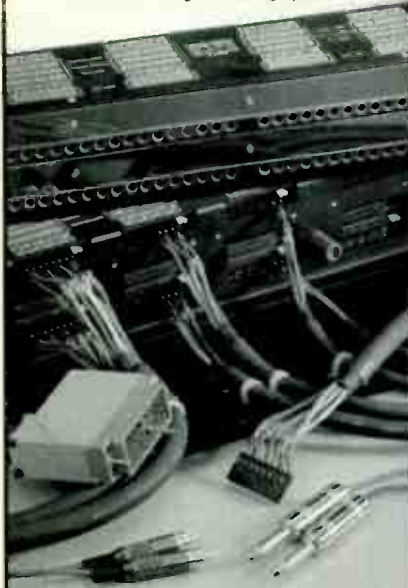
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130 NOVEMBER EQ

PEAVEY PS 2482

continued from page 38

The PS 2482 has eight stereo effect returns, each with a 60 mm fader for level control. Any of the returns can be assigned to any of the eight busses (as well as the L-R mix), so printing effects to your multitrack is as easy as pushing a button. There is high- and low-shelf-type EQ on every return as well as sends to auxes 1 and 2 (switchable to 3 and 4). The idea behind this is that you can use the auxiliaries for a headphone cue and get reverb into the cans without having to repatch any cables.

The Peavey PS 2482 is not just another 8-bus recording console. The company has obviously put a lot of thought into its design. While a lot of the numbers look similar to those from other boards already out there, the design team of PS 2482 has shown that their research and development extended to the console's operation in the recording studio and not just in the lab.

EQ

DRAWMER DS201B

continued from page 120

and it's often worth trying this out on even the tightest of complementary tracks just to see if it can make them even better.

IN USE

The DS201B is a wonderful box that remains a favorite because it is still as relevant today as it has ever been. You can set it up to deal with a noisy mic track with great sensitivity simply because you can really tune into the unwanted noise quotient with the filters. And the same goes for topping and tailing stereo program — one of the best effects you can create with keying is to gate a keyboard pad triggered from a sequenced rimshot track, as this can add a wonderful syncopated feel to the bedrock track.

CONCLUSION

Fourteen years down the road and this is still one of the best noise gates you can buy. There are fancier ones, even technically more elaborate ones, but nothing deals with the fundamental business of gating any better than the Drawmer DS201B.

—Zenon Schoepe

THE BEATLES

continued from page 70

in a quarter century, might easily have inspired other material to have been recorded, but apparently this didn't happen even though it was discussed. Paul McCartney states, "We talked about it, but it seemed more natural with John there. People can't say, 'Well, there's only three of you,' or 'You should get Julian or Sean in.' This way we can say, 'Look, it is the Beatles, whether you like it or not, even if it is done technically, it actually is the Beatles on the record — through the wonders of technology."

So what of the finished results? Perhaps the best person to be judge of that is George Martin who has no hesitation in giving the tracks his full approval. "They sound like the Beatles as though John were back here now, and are more contemporary than the old recordings. They're awfully good and are guaranteed to be #1's all around the world."

The Beatles themselves are said to be delighted with the results, and, according to McCartney, when Ringo first heard the finished mixes, he reacted by exclaiming, "It sounds like the bloody Beatles!"

"Normally I don't show off about songs beforehand," says McCartney, "but I must say they are two real cool tracks. It's spooky to hear John sing lead, but it's beautiful. It's the impossible, but one way or another we pulled it off. It was a joyful experience. It was magic."

And the magic may continue. Apparently there is an additional song on the Lennon tape, which must fuel speculation that a third new Beatles single could be in the offing.

EQ



Photo © Apple Corps Ltd.

LOOK AT WHAT THEY'RE SAYING....

LOOK AT WHAT THEY'RE SEEING....

"I grabbed Plus a few hours ago and have been "wow-ing" and "oooh-ing" all evening <g>. This is going to knock them out I think!"- Dave Tosti-Lane



"Very impressive. Never seen anything like it on a PC, that's for sure! Quite a piece of work."- Lauren Weinstein

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World Radio History

Sennheiser HDC 451 Headphones

Will these 'phones let you hear what you've been missing?

BY HOWARD MASSEY

There's no getting around it: listening to music on an airplane is a frustrating experience. Whether you're using the airline's own awful headphones or your own personal stereo, there's a constant struggle to just hear the music over the roar of the engines and the cabin's air conditioning system.

Sennheiser's new HDC 451 headphones provide an elegant (if expensive) solution to this problem. These comfortable, lightweight open-air cans use a very clever technology (called NoiseGard active noise cancellation) whereby small microphones are mounted in the headsets themselves. The sound they pick up is routed to special internal circuitry which reverses the phase of signal that falls within the 100 Hz–2 kHz frequency area before feeding it to the headphone diaphragm. On an airplane, this has the astonishing effect of removing about half of the jet engine/cabin air conditioning noise, thus greatly increasing the clarity of the music you're listening to. You can even use the headphones in this active noise cancelling mode without plugging them into a signal source—a welcome feature on those red-eye flights when sleep is otherwise elusive. Though fitted with a stereo mini-phone (3.5 mm) jack, adapters are included to allow the 451s to be used with airline sound systems or with home stereo systems.

I had the opportunity to try out a pair of HDC 451s on a 13-hour flight recently and it was love at first listening! The only drawbacks I found are that, due to their high impedance rating, the 451s don't deliver quite as much level as standard Walkman-type headphones; also, I did detect a slight (though perceptible) loss in high-end response when the noise cancellation circuitry was switched in, though this

is a fair enough tradeoff for the removal of so much outside roar.

At \$ 249 (list price), the HDC 451s are a luxury, to be sure, but if you fly a lot and want to be able to check your mixes in transit (or if you simply enjoy listening to music as a means of whiling away the time), my advice is to go ahead and spoil yourself—these are definitely among the best traveling companions you'll find.

For more information, contact Sennheiser Electronic Corporation, 6 Vista Drive, P.O. Box 987, Old Lyme, CT 06371. Tel: 203-434-9190. Circle EQ free lit. #132.

JUST THE SPECS

Freq Response: 20 Hz to 18 kHz

THD: less than 1%

Impedance: 160 ohms

Active Compensation: ±10 dB from 400 Hz to 1 kHz

Power Supply: 2 x AA alkaline or NiCad batteries

Weight: 110 g (without cable)



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39	BASF	10	617-271-4000	78, 66	Music Industries Corp.	44, 71	516-352-4110
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Balanced or Unbalanced...

...Is that the question?

BY EDDIE CILETTI



After all these years, interfacing audio gear still challenges seasoned pros and neophytes alike. That analog audio isn't always plug-and-play does not inspire confidence in the threatened promises of computer manufacturers hoping to bring high tech to the masses.

One of the reasons audio gear ends up on my service bench is because it has been incorrectly connected to the outside world. This is especially true of equipment that is balanced either with active circuitry or transformers. The goal is to take advantage of balanced operation whenever possible, but in largely unbalanced systems, the balanced stuff must be properly compromised in order to protect the gear and minimize problems.

Balanced and unbalanced devices can live in harmony provided a "systems" approach to the interconnecting process is employed. Installers must have an arsenal of tools at their disposal, as well as an intimate knowledge of all the gear, the possible wiring and configuration variations, plus hardware solutions such as a level-matching box.

Immediately after a trip to my shop for service, a customer returned his transformer-balanced UREI LA-3A limiter claiming it had little or no output. I suspected the problem was wiring related. Part of my interface weaponry includes a custom input/output (I/O) box designed to interface balanced gear to unbalanced test equipment. With it, I was able to properly connect his vintage limiter — thus sparing my good name.

E-I-E-I/O

I could exaggerate and say that E-I-E-I/O stands for "Eddie's Interface Examiner for Inputs and Outputs," but what it really means — if you're up to it — is that we're going to embark on an extremely simple construction project. Most of this column will cover how the gear works so you'll know how to use and interpret feedback from the I/O box.

The approach for unbalancing the outputs of both passive and active electronics is shown in fig. 1 via the switching options provided by S1 and S2. Note that the transformer-based (TB) circuit at the top can have one of its signal legs tied to ground. Applying this "old dog" trick to the Active Balanced (AB) puppy at the bottom of fig. 1 will short an amplifier output to ground. This is not the way to extend the useful life of your gear.

10/4, GOOD BUDDY

One question you should be asking is, "Why not buy and use a 10/4 box?" It is true that most interface problems are solved by simultaneously shifting the level down or up and by converting from balanced to unbalanced (or vice versa) operation. However, there is usually no provision to isolate these features.

For example, consoles such as

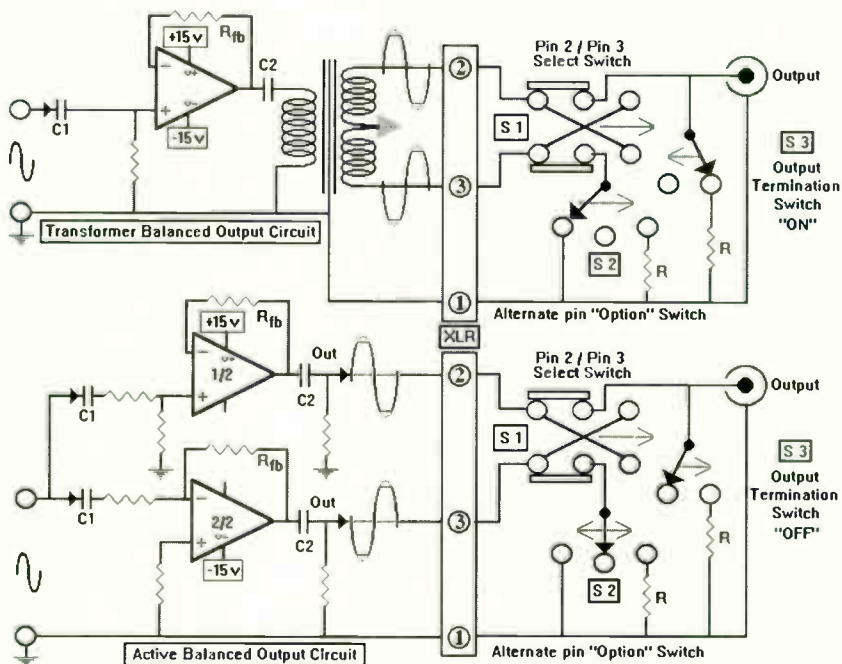
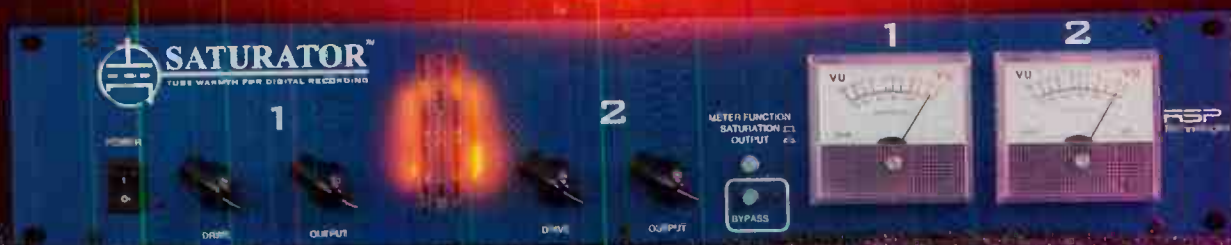


FIGURE 1A (TOP) & FIGURE 1B (BOTTOM): Transformer and Active output circuitry is to the left — Top and Bottom, respectively. The XLR input to the E-I-E-I/O box is the vertical box in the center. To the right, switches S1 and S2 show the proper connections for listening to and wiring each type of balanced device. The funny triangle on the secondary side of the transformer is "The Imaginary Center-Tap" the visualization of which should help you better understand how the two out-of-phase signals are developed.



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World Radio History

TAC Scorpions and very early D&R desks have unbalanced multitrack and 2-track tape returns, respectively. An AB device, properly wired for balanced operation, is likely to cause crosstalk into the entire system. In this case, the wiring must be made unbalanced — at the source — by connecting “shield” and “low” (typically the bare and black wires) to XLR pin 1. Connect the “high” wire (typically red) to either pin 2 (the “+” phase) or pin 3 (the “-” phase) of the signal. The downside of this option

is a level loss of precisely 6 dB, still a better alternative than choosing the -10 outputs of the machine.

The balanced input amplifier circuit in fig. 2 is similar to that used in +4 to -10 level matching boxes. Disabling the resistive divider at the output will permit proper balanced-to-unbalanced conversion without a level loss. Using such a box could be cost prohibitive when a multitrack tape machine is involved. Gaines Audio (Tel: 1-800-442-0780) sells bare circuit

boards that can be assembled into a cost- and space-saving package.

NOW ENTERING OH I/O!

The I/O box comes in handy if you suspect a problem with either the gear or the wiring. Isolating the problem will save you the hassle of taking gear in for repair only to discover the problem “isn’t any further than your own back yard.”

S1, a double-pole, double-throw (DPDT) switch is used to interrogate the

BUILDING E-I-E-I/O

Radio Shack gets a lot of free mentions in this magazine because they offer the convenience of having all of the parts in one place. (See the table below for the list.) Alternate sources include two great mail-order surplus houses: All Electronics Corp. (Tel: 818-904-0524) and Hosfelt Electronics (Tel: 614-264-6464). Both companies have great buys on high-quality parts, for example, gold-plated switches. Sometimes the stuff is so cool, I can’t help buying parts I don’t even need (yet)!

Enclose Yours

I built the I/O into a 4 1/4" x 7 1/2" x 2 3/8" enclosure. (See fig. A for the physical layout.) There is plenty of room inside the box to comfortably work — a plus if you’re new to the “custom electronics” scene. Minimal tools are required if you choose, as I did, to mount the RCA phono jacks to the top metal panel along with all of the switches. Use a 1/4-inch drill bit to make these holes. A larger hole must be made — with the same drill bit and a reamer — into one side of the plastic case for the XLR harness. (Remember to feed these wires through the hole before soldering. Use a grommet to reduce wear and tear on the cable jacket and clamp wires to the top panel with a wire tie to reduce stress to the physical connections.)

I chose XLR connectors for the balanced I/O harness to facilitate connection to the outside world. In addition, adapters to 1/4-inch plugs or to horseshoe lugs for barrier strips were easily made. If you prefer chassis-style XLR connectors, reduce the space between parts. This option requires additional tools and mechanical skills, as well as a more substantial top panel. (An all-metal box, such as those made by Hammond or Bud, might be a better choice for road abuse.)

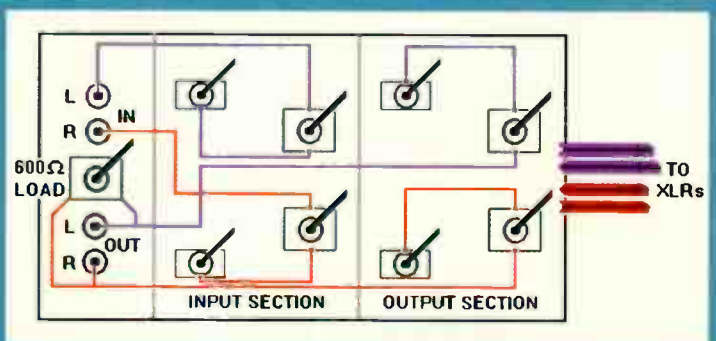


FIGURE A: Physical layout of the E-I-E-I/O box.

DESCRIPTION	PART NUMBER	QUANTITY/ea.	PRICE
Project Box	270-224	1 @ \$3.49 each	\$ 3.49
RCA chassis jacks	274-852	4 (2 for \$ 2.59)	\$ 5.18
XLR jacks	274-011	2 @ \$3.59 each	\$ 7.18
XLR plugs	274-010	2 @ \$3.59 each	\$ 7.18
DPDT switches	275-636	4 @ \$ 3.39 ea.	\$ 13.56
SPDT on-off-on	275-325	4 @ \$ 3.39 ea.	\$ 13.56
680-ohm resistors	271-021	6 (2 for \$ 0.39)	\$ 1.17
22-gauge wire	278-1218	90 feet for \$3.99	\$ 3.99
balanced cable	278-777	30 feet for \$ 7.99	\$ 7.99
grommets	64-3025	31 assorted pieces	\$ 1.39
wire ties	278-1632	30 for \$ 1.59	\$ 1.59
wire tie mounts	278-441	10 for \$ 1.59	\$ 1.59
TOTAL			\$ 67.97

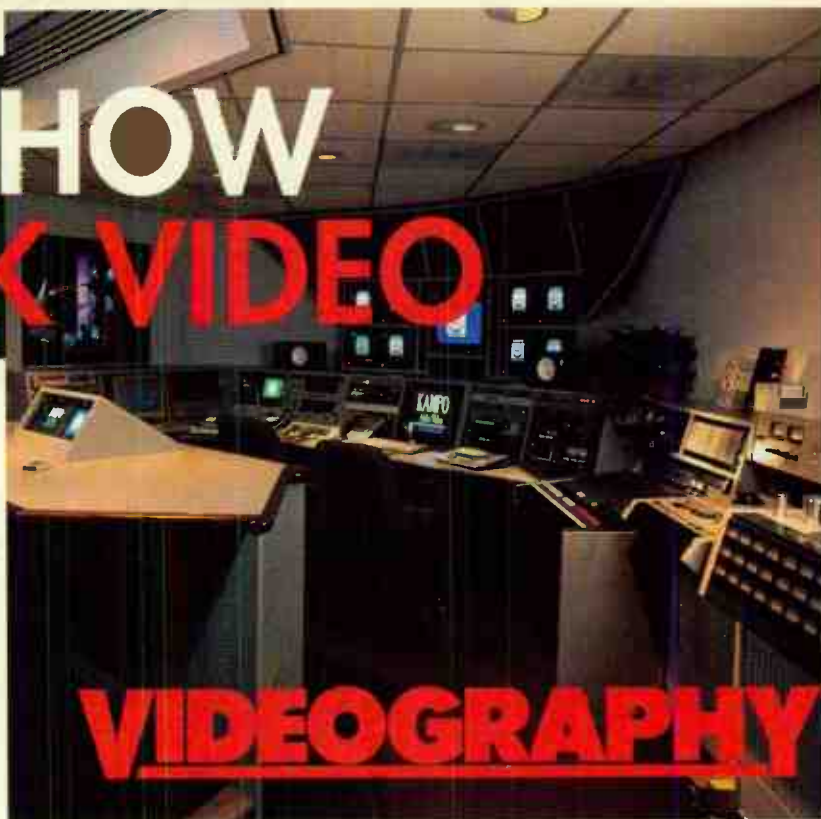
Bound To Earth

Even though the top panel is made of aluminum, be sure to use ground lugs and lock washers on the phono connectors. Attach a wire from each jack to a common “star” ground lug mounted on the metal panel. The shields from pin 1 of the XLR connectors should also make this connection. When finished, a little nail polish on the threads will help keep things from coming loose.

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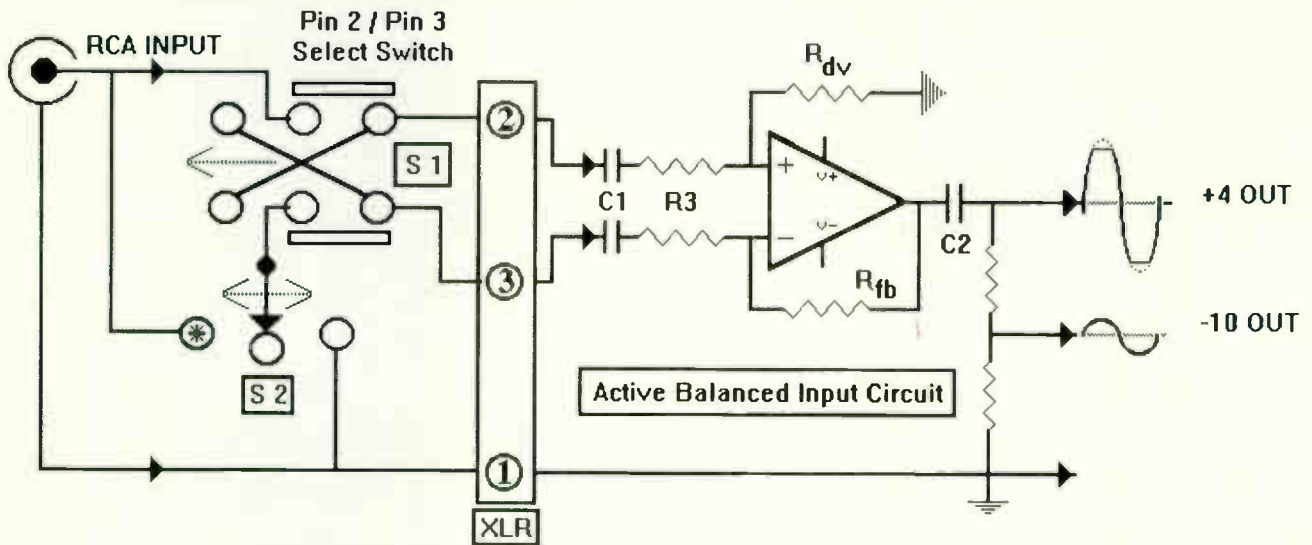


FIGURE 2: To the left, the input side of I/O with an optional position added to S2 for testing Common Mode Rejection Ratio (CMRR). To the right is a typical active balanced input circuit followed by a pair of resistors that create a voltage divider to drop the level from +4 to -10.

two signals that comprise a balanced output circuit. One-half of S1 selects the signal from XLR pin 2 for monitoring purposes, while the other half connects XLR pin 3 to S2, a three-position (ON-OFF-ON), single-pole switch. The signal being monitored will change as the signal routed to S2 is shorted to ground, terminated via 620-ohm resistor or left floating in the breeze.

With S2 in the grounded position, a happy AB circuit with cross-feedback will react by increasing the level on the opposite XLR pin by 6 dB. TB circuitry, however, will not work unless S2 is in the shorting position. Unbalanced gear won't care, but I/O will tell you which pin is HOT.

To test an AB circuit for headroom — on a DAT machine, for example — start with S2 in the “open” position. Apply a sine wave to the input, adjust the record level for “0 dB” with no “overs.” No clipping should be heard until S2 is closed. If clipping does occur, there's a likelihood of system-wide crosstalk and damage to the source. Take care to ensure that this device is properly unbalanced. All gear should have the ability (possibly via switch or internal jumpers) to deliver full headroom in either balanced or unbalanced mode.

DAMAGE CHECK

A typical symptom of damaged AB output circuitry is a level drop of 6 dB. If you suspect this has happened and your wiring seems good, use the I/O box to verify by alternately flipping S1.

(Audio should appear on both pin 2 and pin 3.) A properly operating circuit, when delivering a nominal +4 dBu signal across both XLR pins, will also yield a -2 dBu signal when measured from pin 1 (signal common) to either pin 2 or pin 3. Though this is 6 dB down from +4 dBu, the pair of signals properly add up at a destination that is either active or transformer balanced.

A variation of the “prolonged abuse” theme will result in the premature roll-off of low frequencies. If this is the case, take a close look at the coupling capacitors (C2 in fig. 1), which, if damaged, will appear to be swollen at the top. You can exaggerate the problem by applying a 600-ohm load via switch S3.

By the way, damage to output capacitors will also occur if a device is connected to a microphone input equipped with 48-volt phantom power. (This is one reason direct boxes were invented.) Not only is this an impedance mismatch, but it is also the equivalent of a 48-volt electronic enema!

THE GOEZINTA

I built the I/O box to have the ability to simultaneously test stereo inputs and outputs. The schematics for the two circuits are similar, but to interrogate the inputs of a device, S3 is not required. In addition, the function of S2 has been modified to route an unbalanced test signal to both pin 2 and pin 3. (See fig. 2 for the schematic. The asterisk indicates the wiring change.) This variation provides the ability to test the Common Mode Rejection Ratio

(CMRR). Properly implemented, balanced circuitry rejects noise induced into the cabling. (See your equipment's service manual for the location, if any, of the CMRR adjustment.)

Substantial monitor gain is required when checking CMRR. To be safe, use a limiter at the output of the device under test (a 20:1 ratio is recommended), crank the monitor gain and note that the signal should completely cancel. Make sure your speakers are fused. Careless flipping of S2 could be hazardous to your wallet!

SUMMARY

Gear interface can be the Rubic's Cube of audio. Even when the source is known to be an unbalanced device, problems would be minimized if balanced inputs (on a keyboard mixer, for example) were standard and not the exception. Once the domain of transformers, IC op amps make this feature possible without added expense.

The I/O box is not a solution, but it is a useful learning tool. Readers that build I/O can take advantage of its one “special effect” — the ability to flip signal phase 180 degrees. It's a real ear twister on stereo devices and will provide much insight if you are hip to surround sound! (If compatibility is important, remember to always check wild stereo effects in mono.)

Note: Construction tips for I/O are available via America Online. Go to Craig Anderton's Sound, Stage and Studio via keyword “SSS,” then press the EQ Online icon.

Sound Advice

From: John Agnello - Bob Barry - Bearsville Studios - Ray Benson - Big House Studio Bismieux Studio - Joe Blaney - Scott Booney John Cale - Rick Chertoff - Joe Chiccarelli - Mark Egan - Seth Glassman - Tom Jung - Bob Khezzari Dave Kirkpatrick - Cedric Lee - Stewart Lerman Mark McKenna - Mark Mason - John Siegler John Siket - Sound Techniques - Dave Thoenner Butch Vig - Waterfront Studio - William Wittman

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Windows95 = Macintosh87?

Sure, the Rolling Stones may say "Start Me Up," but should you so soon?

BY MARTIN POLON



The extraordinary \$150 million marketing campaign that has propelled the initially phenomenal interest in using Windows95 has, at its root, the desire of most, if not all, computer users to possess state-of-the-art operating system software. The pitch for Windows95 is to obtain more speed and greater computing power and, for those just now thinking about adopting audio editing capability on the PC, is the desire to buy "the most and the best" in terms of compatibility and so-called "drag and drop" performance.

It would be fashionable to call Windows95 something like "Mac87" or "Amiga85." That would imply that Macintosh and other computer operating systems did what Microsoft has done in 1995, 10 these many years ago. Unfortunately, we are entering a period of operating system confusion, with significant changes to the operating platforms, plus major and significant upgrades to the various microprocessor engines, plus transition to new interconnect busses. But no other change in computer technology has raised more interest or prompted more questions than the long-awaited and heavily publicized introduction of Windows95.

The numbers on Windows 95 were initially impressive. Although Microsoft had hoped to sell one million pieces of software within the first week — and indeed came close — the volume of complaints coupled with a very mixed reaction from both the computer and conventional press alerted the PC user base that all was not well with the release of the operating system upgrade. Microsoft actually received thousands of phone calls per day for technical support in that same first week. With nearly 2000 of Microsoft's engineers on telephone lines plus hundreds of hired guns from third-party support vendors, the frequently quoted figure of 20,000 calls for help per day that actually got through to someone at Microsoft seems to be validated! All of this has slowed sales to the point where Windows95 has only achieved about 17 to 20 percent penetration of the existing Windows 3.1 user base after the first five weeks of retail availability.

Following three years in development, nearly a year's delay from its original announced release date, and the experiences of some more than 500,000 legitimate Beta test users (plus those running bootleg Betas), the version of Windows95 that emerged at the end of August 1995 was considered flawed by many. Some consider the release to still be premature, especially in terms of compatibility. DOS still exists in Windows95, albeit it well submerged within the operating system. The system is 32-bit, compliant but with backwards compatibility for 16-bit applications.

The actual cost of making the transition to Windows95 can also be prohibitive for many users. Operating system performance issues aside, Windows95 frequently requires hardware enhancements on many machines, including the need for increased processor speed and power, more hard-drive storage space, and additional RAM memory chips. Software that is both compliant with and capable of taking advantage of the enhancements on Windows95 must be purchased for the advantages of the new operating system to be consum-

mated. Consulting groups estimate that the average business PC will cost its owner more than \$1000 to transition to Windows95. That charge is per machine, and does not deal with the more elaborate needs of computers used in personal and project studio facilities; not to mention audio applications in larger studios.

In fact, in the opinion of some audio users who have already loaded Windows95, the built-in compatibility drivers will not accomplish set-up of correct configurations for complex audio/video applications and editing software 100 percent of the time, or even 75 percent of the time without significant additional effort. The "rule of thumb" for W95 seems to be about a 50 percent success rate in establishing compatibility for computer software and peripheral hardware. The same could be said for the many hardware peripherals unique to audio and post-production such as RAID drives, servers, video and audio peripherals, plug-in boards, audio recorders, and audio input devices.

The bottom line is this: One, accept the fact that Windows95 is here to stay. The sheer power of the \$150 million marketing campaign is going to compel people to use it: good, bad, or indifferent. Considering cost and all of the various unknowns, Windows95 does not appear to be a necessary addition to the technical world of audio in the short term. If you are currently using Windows 3.1 and you are happy with your setup, then waiting until patches are available for your applications software, peripheral drivers, and Windows95 is a logical move and leaves one from ending up on the bleeding edge of technology. If, on the other hand, you are buying a brand new P6 Pentium PC with a 1 GB hard drive, 12 to 16 MB of RAM memory chips, and preloaded Windows95, the transition may be easier, especially if it includes brand new applications conformed to Windows95. Nevertheless, it does appear that sitting on one's hands may indeed be the safest course to follow for the immediate future. **EQ**

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- The 'business' of the live reinforcement business

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WHEN: January 15-17, 1996 (preceding Winter NAMM in Anaheim, CA)

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SHURE

SM58 Unidirectional Dynamic Microphone

Consistently the choice of professional performers around the world, the SM58 is a rugged unidirectional dynamic mic with a highly effective built-in wind and pop filter.

- Self-contained spherical filter to control explosive breath sounds ("pop") and wind noise in outdoor locations. Unusually effective cardioid pickup pattern to minimize background noise and undesirable effects of studio and location acoustics.

SM57 Unidirectional Dynamic Microphone

The classic SM57 is the "workhorse" mic of stages and studios worldwide. Its carefully contoured frequency response means clean, well-defined instrumental reproduction and rich, warm vocal pickup on lecterns or stages.

- Unusually effective cardioid pick-up pattern minimizes effects of studio or location acoustics and background noise. Rear and side rejection uniform to very low frequencies and completely symmetrical about microphone axis.

SENNHEISER RF CONDENSER MICROPHONES

Unlike traditional condenser mics, the capacitive transducer in Sennheiser condenser mics is part of a tuned RF-discriminator circuit. The output is a relatively low impedance audio signal which allows further processing by conventional bi-polar low noise solid state circuits.

MKH 20 P48U3 Omnidirectional

Low distortion push-pull element, transformerless RF condenser, flat frequency response, diffuse near-field response switch (+6 dB boost at 10 kHz), switchable 10 dB pad to prevent overmodulation.

MKH 40 P48U3 Cardioid

Highly versatile, low distortion push-pull element, transformerless RF condenser, high output level, transparent response, switchable proximity equalization (-4 dB at 50 Hz) and pre-attenuation of 10 dB to prevent overmodulation.

MKH 60 P48U3 Short Shotgun

Short interference tube RF condenser, lightweight metal alloy, transformerless, low noise, symmetrical capsule design, smooth off-axis frequency response, switchable low cut filter (+5 dB at 100 Hz), high frequency boost (+5 dB at 10 kHz) and 10 dB attenuation.

MKH 70 P48U3 Shotgun

Extremely lightweight RF condenser, rugged, long shotgun, low distortion push-pull element, transformerless, low noise, switchable presence (+5 dB at 10 kHz), low cut filter (-5 dB at 50 Hz), and 10 dB preattenuation.

TASCAM

DA-88 Digital Multi-Track Recorder

The first thing you notice about the eight channel DA-88 is the size of the cassette - it's a small Hi-8mm video cassette. You'll also notice the recording time - up to 120 minutes. These are just two of the advantages of the DA-88's innovative use of 8mm technology.



- The ATF system ensures that there will be no tracking errors or loss of synchronization. The DA-88 doesn't even have (or need) a tracking adjustment. All eight tracks of audio are perfectly synchronized. What's more, this system guarantees perfect tracking and synchronization between all audio tracks on all cascaded decks - whether you have one deck or sixteen (up to 128 tracks).

- One of the best features of the DA-88 is the ability to execute seamless Punch-ins and Punch-outs. This feature offers programmable digital crossfades, as well as the ability to insert new material accurately into tight spots.

Fostex RD-8 Multi-Track Recorder

Fostex has long been a leader in synchronization, and the RD-8 redefines that commitment. With its built-in SMPTE/EBU reader/generator, the RD-8 can stripe, read and jam sync time code - even convert to MIDI time code.



- Full transport control is available via the unit's industry-standard RS-422 port, providing full control right from your video bay. The RD-8 records at either 44.1 or 48kHz and will perform Pull-Up and Pull-Down functions for film-video transfers. The Track Slip feature helps maintain perfect sound-to-picture sync and the 8-Channel Optical Digital Interface keeps you in the digital domain.

Roland DM-800

Digital Audio Workstation

The DM-800 is a compact, stand-alone multi-track disk recorder that provides an amazing array of features at an unbelievably low price.



POWERFUL EDITING

- Time Compression, Pitch Compression
Completely Non-Destructive Cutting, Erasing, Copying
Very Fast Looping for Music or Ambiance Editing
Scrub Preview and Preview to, from and thru
Six Levels of Waveform Zoom for Fast Editing

ACCURATE SYNCHRONIZATION

- Frame Accurate Sync to any Time Code
Locks to MTC
Generates and Reads all Types of SMPTE, including 24 25, 29.97 30 (Drop/non-drop) Frames per Second
Incoming SMPTE Reshaped to Output Jack

FLEXIBLE I/O STRUCTURE

- Full Digital Patch Bay
Stereo Aus Send Buss
Two Stereo Aux Returns
Direct Channel Outputs
Digital Stereo Input and Two Digital Stereo Outputs
Four Balanced Analog Inputs with Gain Controls
Four Balanced Analog Outputs with Option for 4 More

RECORDING OPTIONS

- Records to Standard SCSI Drives
Up to 24 Hours Recording Time Possible
Uses Magneto-Optical or Squam Drives for Fast Project Changeovers
Optional Internal 2.5" Drives for Portable Operation

FULL AUTOMATION

- Dynamic and Snapshot Automation of Level, Pan, 2-Band EQ, including Frequency Select, Boost and Cut
Microscope Editing of Automation Data
Phase Level Editing of Level, Crossfade and Fade In/Out

PROJECT CATALOGING

- Up to 150 Projects in Line at Once
Easy Cataloging of Sound Effects and Projects
Easy Transfer of Sounds from One Project to Another
File Compatible with DM-80

TRIGGER FEATURES:

- Trigger Mode to Play a Combination of 8 Tracks for Vocal Fills or Sound Effects Placements
Advanced Trigger Mode for Live Operation with Preset or Dial Up Cue of Phrases to be Played One after Another

HIGH QUALITY SOUND

- Sampling Rates of 48, 44.1, 32 kHz
18 Bit A/D and D/A with 128 and 8 Times Oversampling
24 Bit Internal Processing
Superb Converters

MIDI FEATURES:

- MIDI Machine Control
Internal Tempo and Sub-Beats
Accurate Editing by Bars and Bands Maps
MIDI Clock and Song Position Pointer Output
8 MIDI Triggers for Instant Phrase Playback
MIDI Trigger of Record and Punch In/Out
Tempo Maps from External Sequences, MIDI or Tap Input

VIDEO OUT

- Composite, S-video, Digital RGB Output
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beyerdynamic

TG-X Dynamic Mic Series

The entire TG-X family of microphones is based on neodymium technology coupled with rugged construction and designed for optimum performance in a stage environment

TG-X 5

- Clip-on goose-neck drum mic with high SPL capability
Acoustically coupled to capture shell sound as well as skin sound
Internally shock mounted for isolation from mechanical noise
Rugged construction with convenient clothes peg mounting



TG-X 30/35

- Ultra-slim flexible gooseneck for easy positioning
Broadcast performance microphone with rugged construction
Lightweight, low profile adjustable neckband
Applications: Hands free vocals (drums/keyboards) and aerobics
TG-X 30.15 Omni neckwork with pre-amplifier
TG-X 30.16 Omni neckwork for wireless transmitter
TG-X 35.15 Cardioid neckwork with pre-amplifier
TG-X 30.16 Cardioid neckwork for wireless transmitter

TG-X 40

- Hypercardioid polar pattern with excellent isolation from unwanted sound
Flat, wide frequency response for uncolored sound reproduction
Rugged construction
Applications: Vocal piano, orchestral/recital recordings, strings and sampling



TG-X 50

- Hypercardioid kick drum with high SPL capability
Reduces shell ring in bass drum
Exceptional gain-before-feedback
Superb transient response and extended low frequency range
Applications: Kick drum, floor toms, congas and timpani



TG-X 80

- High quality hypercardioid vocal mic
Full range frequency response
Studio quality accuracy
Excellent off-axis isolation
Shock absorbing rubber ring
Applications: Vocals, piano, strings, brass, percussion, windwood, overheads sampling

We are also full stocking dealers of audio-technica, Electro-Voice

TASCAM 103 Mastering Cassette Deck

Cost effective three head stereo midbox cassette deck, appropriate for audio and video production facilities. With its three head design you can hear what is actually on the tape as it is recorded.

Designed primarily for mixdown, the 102 provides solid performance and sound quality with durability and reliability. Although it is a two head unit, the 102 closely matches the performance and features of TASCAM's 103 Mastering Deck.

202MKII Dual Recording Cassette Deck

Dual record cassette deck offers dubbing and copying capabilities at a reasonable price. The deck is capable of simultaneously making two identical recordings from the same source, or making a single extended, recording first on one tape (both sides) then on the other (also both sides). Copying can be easily performed by using one side for playback and the other for record. Can also provide continuous background music, playing first both sides of one tape, then both of the other.

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SONY TCD-D10 PRO II Portable DAT Recorder

Packed with features and functions, the compact TCD-D10PRO II is everything a professional needs in a portable DAT recorder. Measuring only 10" x 2 1/2" x 7 1/4", it provides high performance, reliability and flexibility. Among its many features are high speed (10K search, LCD multi-function display, 4-motor Direct Drive transport mechanism and absolute time recording capability. With absolute time code, tapes recorded by the TCD-D10 PRO II can be used immediately as source material for the PCM-7000 Series DAT editing system. Offering maximum performance and capabilities in a minimum package, the TCD-D10 PRO II is the recorder of choice for any field application.



- Has balanced XLR input, switchable microphone (60dB) or line (+4dB) inputs. A 12-pin digital connector provides interfacing with AES/EBU digital signals of 32 L, +4.5, or 48.0 kHz sampling rate. This means that compatibility with other digital systems is assured. It also provides the convenience of digital cutting and editing without any degradation.
- Equipped with a comprehensive self-diagnosis function that constantly monitors the rotation of the head drum, capstan and reels. The tape transport mode and location/track data are continuously checked as well. Up in detection of trouble, the tape is brought to a forward stop and unlatched automatically to protect the tape and the recorder.
- Up to 99 start IDs can be recorded in this subcode area. When the record button is pressed, the start ID is recorded automatically for 9 seconds. During recording, it can also be added manually to any position of the tape. Search for these start IDs is performed in two modes at 100 times normal speed.
- Offers a maximum spooling time of 140 x normal speed. A two hour tape can be rewound or fast forwarded in under a minute.
- 26-segment digital peak level meters include level indicators, closely track input signal, for accurate level indications.
- During playback, the date and time of recording is displayed.
- Has a 5-segment battery indicator. The last segment blinks on and off, notifying you to change batteries.
- To eliminate distortion caused by unexpected peaks, the TCD-D10 PRO II incorporates a record-level limiter with a fast attack time of 200ms. The microphone attenuator prevents distortion by suppressing the signal level 20 dB.
- Immediate playback is possible through a built-in speaker.
- A wired remote controller is supplied to control the record, play, stop, and pause functions of the recorder. The top end of the controller is designed to accept a microphone holder. Two microphone stand screw adaptors are also supplied.
- The supplied Ni-MH rechargeable battery pack provides 1.5 hours of continuous operation. The optional NP-D10 battery adapter enables 1-hour continuous operation on AA-size batteries. With the use of the supplied AC-EB AC power adapter, it can also be operated on 200-240 VAC, 50-60 Hz.

AMPEX PROFESSIONAL AUDIO TAPE



467 DAT Tapes	
467-R015P	4.75 467-R030P 5.96
467-R045P	5.25 467-R060P 6.48
467-R090P	7.25 467-R120P 9.28
467 Digital Audio Mastering Tape	
467-7331J	1" x 4660' 104' NAB Reel 64.49
467-2703J1	1" x 4660' 104' Heavy Duty Precision Reel 79.95
467-5703J1	1" x 4660' 104' Heavy Duty Precision Reel 149.95
489 Digital Mastering Tape Audio	
DMS010AD	1/2" x 810' Gray Library Box 8.99
DMS100C	1/2" x 810' Clear Sleeve 8.09
456 Studio Mastering Tape	
456-1-1111	1" x 120' 7" Plastic Reel 7.15
456-1-3111	1" x 250' 10" NAB Reel 18.99
456-272111	1" x 250' Plastic Hub 26.99
456-273111	1" x 250' Plastic Hub 33.99
456-572111	1" x 250' Plastic Hub 52.99
456-573111	1" x 250' 10" NAB Reel 58.49
456-973111	2" x 250' 10" PREC 125.99
499 Grand Master Gold Studio Mastering Tape	
499-174111	1" x 250' 10" NAB Reel 20.49
499-274111	1" x 250' 10" NAB Reel 27.49
499-374111	2" x 250' 10" PREC 134.99

SONY PCM-2300/PCM-2700A DAT Recorders

The superb audio quality of digital recording and the convenience of DAT cassettes is not restricted to broadcasting and post-production applications. In fact, it is just as relevant to business and educational applications. To meet the requirements of all these sectors Sony offers the PCM-2300 and PCM-2700A DAT recorders. While both are perfect for simple recording and playback at recording studios, the PCM-2700A is also well suited for simple program transmission at broadcasting stations. Both feature exceptional sound quality, three sampling frequencies, absolute time recording, long record/playback time, alternative subcode recording and digital fader.



THREE SAMPLING FREQUENCIES

At normal tape speeds, either a 44.1 kHz or 48.0 kHz sampling frequency can be selected. When set to long play (LP) mode, they provide 12-bit non-linear digital recording at 32.0 kHz.

PROFESSIONAL PERFORMANCE

- The servo system is completely controlled by carefully programmed software. This features sophisticated, smooth transport control, which optimizes tape handling and increases the search speed to approximately 150 times normal.
- Absolute time can be recorded in the subcode area of the DAT tape. DAT tape with absolute time is ideal for editing with the Sony PCM-7000 Series Editing System, as it translates A-time into SMPTE time code.

DIGITAL FADER

A 64-step digital fader is incorporated in both units. Both fade-in and fade-out functions are available on the digital and analog inputs/outputs. The fade duration can be set over from 0.2 - 15 seconds, and can be controlled either locally or by the remote.

PCM-2300 AND PCM-2700A

- The PCM-2300 has unbalanced digital input/output, while the PCM-2700A has dual digital inputs/outputs (balanced and unbalanced), allowing most digital audio equipment to be directly connected. Both also have balanced analog line level inputs/outputs which can be adjusted over a range of +12 dBs to -8 dBs, for connection to many other types of audio equipment.
- The PCM-2300 has a reliable tape transport system driven by three servo-controlled motors, two direct-drive types for head drum and capstan, and a single DC motor for the reels.
- The PCM-2700A employs a four motor direct-drive tape transport with head drum, capstan and reels, all individually driven by servo-controlled motors. The four motor direct-drive mechanism gives even more precise and stable transport.
- PCM-2300 front panel display has a 20-segment peak level meter display with 0.5 dB step peak margin. The PCM-2700A has a 29-segment peak level meter with a 0.1 dB step peak margin indication.

SUBCODES

They record various subcodes separately from the audio data to provide tape search functions. The subcodes include the Start ID, Skip ID, End ID, Program Number, Absolute Time, and Date Functions. Program numbers can be recorded sequentially as the Start IDs and are written (and can be renumbered) in the correct sequence whenever additional Start IDs are inserted.

OTHER FEATURES

- They operate in the Long Play (LP) mode, yielding twice the normal record/playback time. This also makes them compatible with the LP mode of consumer products. In LP mode, a maximum of four hours of recording and playback is possible.
- Built-in crystal clock generates a date function, which automatically increases each recording with time and date info (minute/hour/day of the week/month/year). When tape is replayed it's easily checked for when the recording was made.
- Both units can be installed in a standard 19-inch rack.
- Both included a wireless remote control for remote operation.

PCM-2700A ONLY FEATURES:

- Read After Write function allows you to monitor the recorded signal immediately after it has been stored on the tape. This saves you valuable time, as recorded signal can be checked monitored in real time.
- High-speed locating, in either direction, to points on the tape with a resolution of 1 second by entering the absolute time address via keys on the front panel.
- Convenient remote operation is performed by the optional PM-27100 Remote Controller. Connected via the 37-pin parallel remote connector, it allows basic tape transport control.
- Has 8-pin remote interface to give a fader start function, which is particularly useful for On-Air applications.
- When manually writing the Start, Skip, and End IDs, there is an enhanced rehearsal function which is available for accurate ID recording. While monitoring the ID recording, these can be re-located forwards or backwards in 0.3 second steps.

Panasonic

SV-3700/SV-4100 Professional DAT Player/Recorders



Panasonic's SV-3700 and SV-4100 are designed for professional applications. They have highly accurate and reliable transport systems with search speeds up to 400 times normal play speed. They also feature advanced high-quality analog-to-digital (A-D) and digital-to-analog (D-A) converters and input/output circuitry designed to interface with the widest variety of devices.

SV-3700 Features:

- When recording via the analog inputs, a front panel switch permits selection of the sampling rate (44.1kHz or 48kHz). This avoids the need for a conversion of the sampling frequency in CD mastering applications. When recording through the digital inputs, it automatically clocks to incoming frequencies of 32kHz, 44.1kHz or 48kHz.
- Ramped record mute and unmute with three seconds fade-in and five seconds fade-out provides automatic level changes at the start and end of a recording.
- High speed transport enables searching up to 250x normal speed. High-speed search to 400x normal speed is possible once the tape has been scanned in Play, Fast-Forward or Reverse mode. This ensures access to any point on a two-hour DAT in approximately 27 seconds.

SV-4100 Has All the Features of the SV-3700 PLUS:

Offers enhanced performance required for professional production, broadcast and live-source systems. Features such as instant start, external sync capability, enhanced system diagnostics, additional digital interfaces and an exceptional 20-bit audio/mike the SV-4100 the DAT quality standard.

QUICK START WITH TRIM AND REHEARSAL

- With 8MB of memory holding live seconds of audio data, the Quick Start function provides sound almost instantly after a play command is executed. Other DAT recorders lag about 7 seconds before playback begins.
- Easily adjust the Quick Start position and specify it by a Time, Start ID or PNO. Recording via Quick Start is also possible, allowing two SV-4100s to be used for frame accurate punch-in/punch-out and assemble editing.
- You can adjust the Quick Start position with 1-Frame resolution over a range of 350 frames. Using the shuttle dial and Skip key for adjustment. Frame numbers is preceded by a or - sign. A Time, subcodes and peak level are displayed, to provide a general guide to positioning.
- Without playing the tape, you can monitor the level of stored data to check your Quick Start position. This preview capability is handy before actual editing or on-air play. Repeated play is also possible, using about 1.5 seconds of the data to create a kind of sampler effect.

FRAME ACCURATE INDEXING AND EDITING

- Using the trim and rehearsal functions, you can accurately determine points to write, start and skip IDs. These IDs can be written, rewritten or erased at any point in the recording and automatically renumbered.
- With two SV-4100s connected via the 8-pin parallel remote terminal, synchronized frame-accurate editing can be performed. Continuity of edit points can be checked by rehearsal playback by erasing and editing and position of one of the locate buttons, you can determine a punch-out point as well.

FLEXIBLE SEARCH

- Easily and accurately access your A-Time. You can specify hour, minute, second and frame.
- In most modes, the currently displayed A-Time can be assigned to one of the Locate buttons. Then from Stop, Pause or Play you can rapidly cue to any of these four addresses by pressing its Locate key. In addition, Locate Last takes you to the most recent Quick Start A-Time position.
- Search is also possible by Start ID or program number.

5-MODE EXTERNAL SYNC

Has 5 external sync modes. External sync is essential for applications such as video postproduction and stereo submix recording. It assures uniformity of timing between different equipment so the audio data consistently matches up with the target media.

MULTIPLE DIGITAL INTERFACES

Select from 2 video external sync modes (25, 29.97 and 30 frames per second) or use the word sync or Digital Data modes (which lock to the input sampling frequency).

ENHANCED SOUND

The SV-1100 satisfies the highest professional expectations both in terms of sound and functionality. It features new 20-bit (equivalent resolution) digital-to-analog converters.

5-MODE EXTERNAL SYNC

Has 5 external sync modes. External sync is essential for applications such as video postproduction and stereo submix recording. It assures uniformity of timing between different equipment so the audio data consistently matches up with the target media.

3-WAY REMOTE CONTROL

GPI input allows simple triggering of Quick Start Play. 8-pin parallel remote terminal connects to another DAT deck, computer or wired remote. Includes wireless remote control.

TASCAM DA-P1 Portable DAT Recorder

- With rotary two head design and two direct drive motors the DA-P1 offers one of the best transports in its class.
- XLR-balanced mic/line inputs (with phantom power), accept a broad range of signal levels from -60dB to +4dB.
- Analog line inputs and outputs (unbalanced) plus S/PDIF (RCA) digital inputs and outputs enables direct digital transfers.
- Uses next generation A/D and D/A converters to deliver amazing sound quality.
- Supports multiple sample rates (48, 44.1 and 32 kHz) and SCMS-free recording.
- Included in its design is a MIC limiter and 20dB pad to achieve the best possible sound without outside disturbances.
- To monitor your sound there is a TRS jack and level control for use with any headphones.
- Built tough, the DA-P1 is housed in a solid well-constructed hard case. The DA-P1 includes a shoulder belt, AC adapter and one battery.



SONY TCD-D7 DAT Walkman Player/Recorder

- High-quality Standard Play (SP) mode provides two to two hours recording of 16-bit digital audio on a DT-120 DAT cassette. The SP mode is ideal for recording live music.
- Long Play (LP) mode allows up to 4 hours of recording/playback of 12-bit audio on a single DAT cassette. The LP mode is ideal for meetings, conferences or other voice recordings.
- Equipped with digital coaxial and optical input connectors. Maintains highest signal purity for recording and playback of digital sources with all information retained in digital format.
- Also has analog Mic and Line inputs for recording from analog sources without external adapter.
- High-speed Automatic Music Search (AMS) search function finds and plays tracks, skips forward or back up to 99 tracks, all at 100x normal speed.
- Has a Digital Volume Limiter System (DVLS) that increases listening comfort and sound quality by automatically adjusting for sudden level changes of the recording. It also helps prevent sound leaks through headphones.
- Two-speed cue-review lets you hear sound while player is in fast-wind modes, up to 3x or 25x normal speed.
- Compact and portable, it has an anti-shock mechanism that permits accurate recording and playback even while in motion.
- LCD display with backlit windows clearly shows recording level, track number, operating status and 4-segment battery indicator, even in low ambient light conditions.
- Optional RM-D3K System Adapter Kit for complete digital interface. The kit is equipped with the input/output connectors for both the optical cable and the coaxial cable. Therefore you can use it as a relay between the TCD-D7 and other digital equipment. Also includes a wireless remote control.



JVC

XD-P1 Pro Portable DAT Recorder

An integrated package, the XD-P1 Pro combines a DAT recorder and a microphone with digital output in an unbelievable light package.

- Records and plays at all three standard sampling frequencies. Choose from 32kHz for long recording sessions; 44.1 kHz for mastering if CD production or 48kHz for highest fidelity.
- Operates without the restrictions of SCMS (Serial Copy Management System), permitting one generation of digital to digital copy, using 44.1 kHz sampling frequency. You can digitally dub or copy a recording made on the XD-P1 Pro as many times as necessary.
- The supplied detachable pick-up output microphone provides two pick-up patterns. "Telescopic" and "Stereo". A collapsible microphone stand is also supplied, allowing you to set the mic on a desktop for the interviews or conferences.
- Extensive use of aluminum and ultra-thin molding techniques make the XD-P1 Pro compact, lightweight and durable. The main module weighs under a pound (12.5 oz) with microphone and battery it weighs only 22 oz.
- All basic controls are on one side of the unit and readily accessible. You can operate the recorder using one hand.
- Advanced power-saving design and low power-consumption circuitry give the XD-P1 Pro long recording capability - on a single battery charge. Optional rechargeable batteries further extend recording time.
- Supplied AC adapter/recharge works anywhere in the world regardless of voltage or frequency.



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- Individual channel inserts for patching
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- Assignable bar graph level indicator for left and right of group outputs
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- +48v phantom power

dorrough



With today's audio systems stretching the limits of program dynamics it's become critical for engineers to obtain maximum loudness with the minimum of distortion components, to fully utilize the dynamic range available. It is of equal importance that they have a method of monitoring and establishing the maximum safe level at which a system can operate.

That's why every Dorrough Audio-Level Meter simultaneously shows 3 dimensions of program material content. Peak, Average Power and Compression are displayed on a color-coded 40-segment LED scale. Meters are easily viewed while providing precision indications of program energy content.

Loudness Meter Model 40-A
The model 40-A has a scale allowing 14dB \pm headroom in 1dB steps. A stand-alone unit, it measures 8" x 7 1/2" x 6 1/2" and has an internal power supply. Model 40-A-AP has a peak-hold option as well.

Loudness Meter Model 40-B
The Model 40-B provides metering of relative loudness to peak modulation. The 40-B is a scale differentiation of the 40-A and is calibrated in percent (%) modulation, with the lower scale in dB from +3 dB to -3 dB. The 40-B-AP also has a peak-hold option.

Symetrix

Signal Processing Products
601 Digital Voice Processor

- Accepts mic or line level analog signals, converts them to digital (18 bits) and then performs 24-bit digital domain signal processing
 - Processing includes fully parametric EQ, shelving EQ, notch filtering (noise reduction), de-essing, delay, chorusing, gating, expansion, compression, AGC and DC removal
 - Combination of 128 factory presets and 128 non-volatile user programs guarantee predictable and repeatable effects from session to session, performance to performance
 - Has XLR-balanced analog mono/stereo and line inputs and XLR-balanced stereo output, XLR-balanced and S/PDIF (RCA) inputs and outputs, MIDI input/output supports connection to virtually any type of MIDI controller device for programming or controlling the 601 in real time
 - Ideal for a variety of recording, broadcast, live sound, and post production applications
- 488 Dyna-Squeeze**
8-Channel Compressor/Interface
- Can easily increase average recording levels on your digital or analog tape recorder by 10dB with no side effects
 - Tracks processed by Dyna-Squeeze have presence and increased articulation. Subtle sounds become more up front
 - Many professional mixing consoles have output levels that are much hotter than digital recorder inputs. The 488 matches any console to most any digital recorder
- We are a full stocking dealer for the entire Symetrix line**

TASCAM

M-2600 Series
16/24/32 Channel Eight Channel Mixers

- LOW NOISE CIRCUITRY**
- Combining completely redesigned, low noise circuitry with Absolute Sound Transparency™, the M-2600 delivers high-quality extremely clean sound. No matter how many times your signal goes through the M-2600, it won't be colored or altered. The signal remains as close to the original as possible. The only coloring you hear is what you add with creative EQ and your outboard signal processing gear.
 - Double reinforced grounding system eliminates any hum. World-class power supply provides higher voltage output for better headroom and higher S/N ratio
- PREMIUM QUALITY MIC PRE-AMPS**
- The M-2600's mic pre-amps yield an extremely low noise floor, enormous headroom and an extremely flat frequency response. This lowers distortion and widens dynamic range. It also increases gain control to an amazing 51dB. Plus, you get phantom power on each channel.
 - The M-2600 accepts balanced or unbalanced 1/4" inputs, and low-impedance XLR jacks. Better still, the TRIM controls operate over a 51dB input range. For the hottest incoming signals, all it takes is a press of the -20 dB PAD button along each channel strip to bring any signal down to manageable levels. Plug anything into it — keyboards, guitars, basses, active or passive microphones, samplers and more. No matter what you put into it, you can be confident that signal can be placed at optimum levels without a lot of fuss.
- THE BEST AUX SECTION IN THE BUSINESS**
- The most versatile AUX section in its class, rivaling expensive high-end consoles. 8 sends total, 2 in stereo. Send signal in stereo or mono, pre- or post-fader. Available all at once. Return signal through any of 6 stereo paths.



- FLEXIBLE EQ SECTION**
- You'll find both shelving and split-EQ sections on some mid-level consoles. But that's where the similarities with the M-2600 end. The M-2600's bi-directional split EQ means you can use either or both EQ sections in the Monitor or Channel path — or delete the effect altogether with one bypass button. Most other comparably-priced mixers will lock the shelving mix into the Monitor path only, limiting your EQ application.
- ADVANCED SIGNAL ROUTING OPTIONS**
- Direct channel input switching. Assign to one of eight buses, or direct to tape or disk, or to the master stereo bus. Because the group and direct-out jacks are one and the same, you can select either without patching. You won't find this kind of speed or flexibility in a "one-size-fits-all" board.
- ERGONOMIC DESIGN**
- The M-2600 has a big sturdy feel. All buttons are tightly spring loaded, lock into place with confidence and are large enough to accommodate even the biggest fingers. The faders and knobs have a light, smooth "expensive" feel and are easy to see, easy to reach and a pleasure to manipulate. Center detent's assure zero positions for EQ and PAN knobs. Smooth throw 100mm faders glide nicely yet still confidently allow you to position them securely without fear of accidentally slipping to another position.

MICRO SERIES 1202
12-Channel Ultra-Compact Mic/Line Mixer

- Usually the performance and durability of smaller mixers drops in direct proportion to their price. Fortunately, Mackie's fanatical approach to pro sound engineering has resulted in the Micro Series 1202, an affordable small mixer with studio specifications and rugged construction. The 1202 is a no-compromise, professional quality ultra-compact mixer designed for professional duty in broadcast studios, permanent PA applications and editing suites where nothing must ever go wrong.
- BIG CONSOLE FEATURES**
- Working S/N ratio of 90dB, distortion below 0.025% across the entire audio spectrum, switchable +48 volt phantom power and +28 dBu balanced line drivers.
 - Real switchable phantom-powered mic inputs with discrete, balanced mic preamps as good as those found in big consoles.
 - Has 4 mono channels, each with discrete front and mic pre-amp/line input and four stereo channels, each with separate left and right line inputs.
 - Every input channel has a gain control with unity at the center detent for easy setup. Also a pan pot, low frequency EQ at 80Hz, high frequency EQ at 12.5 KHz, and two aux sends with up to 20dB available gain.
 - Main outputs operate either balanced/unbalanced, as required.
 - Switchable three-way 12-LED peak meter displays.
- Master section includes two stereo aux returns, a separate headphone level control, mixing and two stereo aux returns.**
- Line inputs and outputs are designed to work with any line level, from instrument level, to semi-pro -10dB, to professional +4dB.
- HEAVY DUTY CONSTRUCTION**
- Designed for non-stop, 24-hour a day professional duty in permanent PA applications, TV and radio station, etc.
 - Sealed rotary controls instead of open frame phenolic potentiometers in tune with dust and contamination.
 - Has steel chassis, rugged fiberglass circuit boards and a built-in power supply. Also has exceptional RF protection.
- MULTIPLE APPLICATIONS**
- Ideal "entry level" mixer for those just starting a MIDI suite
 - Ideal as headphone or cue mixer, level matching pro audio "tool kit", drum or effects sends submixer, 8-track monitor mixer.

CR-1604 16-Channel Mic-Line Mixer

- The hands-down choice for major touring groups and studio session players, as well as for broadcast, sound contracting and recording studio users, the Mackie CR-1604 is the industry standard for compact 16-channel mixers. The CR-1604 offers features, specs, and day-in/day-out reliability that rival far larger boards. It features 24 usable line inputs with special headroom/ultra-low noise Unityplus circuitry, seven AUX SENDS, 3-band equalization, constant power pan controls, 10-segment LED output metering, discrete front end phantom-powered mic inputs and much more.
- LOWEST NOISE, HIGHEST HEADROOM**
- With the CR-1604 having the lowest noise and highest headroom (90 dB working S/N and 108 dB dynamic range) at the same time are not mutually exclusive. It is free of commonly encountered headroom restrictions, and is able to handle the occasional pegged input with ease. In fact, many drummers consider it the only mixer capable of handling the attack and transients of acoustic and electronic drums.
- CONSTANT POWER PAN POTS**
- Only with constant power pan pots will a source panned hard left or hard right have the same loudness as when it is sitting dead center. While most small mixers pass simple balance controls for pan pots, the CR-1604's carefully optimized constant power pan circuitry make it a professional's tool with the kind of performance necessary for CD mastering, video posting and other critical audio production.
- IN-PLACE STEREO SOLO**
- Stereo "in place" solo allows not only the monitoring of level and EQ, but also stereo perspective. Usually found in very expensive mixers, stereo solo allows you to critically scrutinize and carefully build a mix using all the channels with their respective sends and AUX returns.
- UNITYPLUS GAIN STRUCTURE**
- Proper gain settings are facilitated by proper gain labeling, along with center-click detents on the faders, clearly understandable input trim controls and output meters that read channel levels in solo mode. With properly set levels you achieve very high headroom and low noise at the same time.
- EFFECTS SEND WITH GAIN**
- Unusual circuit design that provides two different "zones" that reflect real world use. Send from each channel can vary in level from off to unity gain, which is the normal range of effects. Stereo sends from other mixers, since you also get another whole zone from the center detent to +15 dB of gain, the channel fader can be pulled down and the effects send can be boosted above unity when more effect is needed.



- INTELLIGENT EQ POINTS**
- Low frequency EQ is at 80 Hz where it has more depth and less hollow midrange "bong" Midrange is centered at 2.5 KHz, providing for more control of vocal and instrumental harmonics. A specially-shaped HF curve that shelves at 12 KHz creates more sizzle and less aural fatigue.
- REAL MIC PREAMPS**
- The CR-1604 has genuine studio-grade phantom powered, balanced input mic preamps on channels 1 through 6. All CR-1604 (and XL110) discrete input mic preamp stages incorporate four conjugate-pair, large-emitter geometry transistors just like the big mixers do. So, when recording natural sound effects to heavy metal or mixing flutes or rock drums, you get the quietest, cleanest results possible.
- BUILT TO LAST**
- The CR-1604 is designed for non-stop, 24-hours-a-day professional duty — even for hours that log 100,000 miles in three months. It has sealed rotary potentiometers that are resistant to airborne contamination like dust, smoke, liquids, and even the oxidizing effects of air itself!
- Optional Accessories**
OTTO-1604
- Advanced sophisticated computer controlled automations for your CR-1604. When connected to the MIDI port of your computer (PC, Mac, Amiga or Atari), each one of the 16 input channels can be programmed to change gain or to mute, just as you would program a sequencer. Master levels can be programmed as well, along with all buss channels.
- XL110**
- While the standard CR-1604 comes with 6 high performance mic inputs, there are times when you need more. Enter the XL110. This simple-to-install accessory adds 10 more (for a total of 16) mic inputs, with the same quality, performance and features as those in the CR-1604.

SENNHEISER

Incorporating state-of-the-art technology and decades of experience, Sennheiser headphones offer outstanding design, superb audio quality and luxurious comfort. From the ear padding to the O.F.C. (Oxygen Free Copper) cable, all materials are carefully selected and precision engineered to ensure incomparable quality.

HD414 Classic

- A re-issue of the world's first open-ear dynamic headphone, the HD414 Classic offers maximum transparency, fidelity and comfort. A limited edition model, the HD414 Classic also features Professor Sennheiser's signature on the headband.
- Radial based diaphragms for more accurate reproduction.
 - Field replaceable parts for long-term enjoyment.
 - Neodymium-ferrous magnets for broad frequency response (18-21,000Hz).
 - 10ft. Kevlar-reinforced oxygen-free copper signal cable with 1/8" - 1/4" stereo phone plug
- \$59⁹⁵**



HD25 SP
Studio Monitor Headphone

- Offering dramatic isolation from external sounds, the HD25SP is designed for professionals who rely on studio monitor headphones for work and pleasure.
- High-efficiency drivers for portable and field use.
 - Modular parts for long term value and durability.
 - Neodymium-ferrous magnets for broad frequency response.
 - Frequency Response: 16-22,000Hz
 - Sensitivity: 105dB
 - Impedance: 70 Ω
- \$119⁹⁵**



HD265
Studio Monitor Sealed Headphone

- Designed to meet the stringent demands of studio professional and audiophile alike, the HD265 breaks new ground in the sealed-chamber headphone format.
- Sealed-chamber headphone format
 - Triple-wound aluminum voice coils for quick transients.
 - Polycarbonate dome-dampening minimizes distortion.
 - Oxygen-free copper signal cable with 1/8" to 1/4" stereo phone plug
 - Frequency Response: 10-25,000Hz
- \$199⁹⁵**

HD535
Dynamic Hi-Fi Stereo Headphone

- The HD535's earcups surround your ears rather than resting on them, for a more natural listening experience.
- Open-back construction and classic design.
 - Light aluminum coils in the transducer systems offers excellent transient and dynamic response.
 - Supported by the open structure, tonal quality develops high dimensional sound qualities.
 - Circumaural, oval earpads for good wearing comfort.
 - Can be connected to all digital and analogue Hi-Fi components
- \$139⁹⁵**



HD545
Digitally Compatible Circumaural Headphone

- The HD545 is the headphone to which all in its price category must be compared.
- Polycarbonate dome-dampening materials for cleaner highs
 - Triple-wound aluminum voice coils mean powerful bass, high output and greater durability.
 - Velvety soft, circumaural earpads and adjustable, padded headband for extended comfort and perfect fit.
 - Oxygen-free copper signal cable assures optimal signal transfer.
 - Includes 1/8" - 1/4" stereo phone plug
- \$169⁹⁵**

HD565
Digitally Compatible Circumaural Headphone

- Offering natural sound reproduction without tonal distortion - the choice for use with the most sophisticated equipment.
- Silk dome-dampening for brilliant highs and ultra-smooth midrange reproduction.
 - Copper-coated aluminum voice coils for high linearity.
 - Bass-tube tuning for extended, powerful low frequencies.
 - Velvet ear cushions provide lavish comfort.
 - Oxygen free copper signal cable with 1/8" - 1/4" stereo phone plug
- \$239⁹⁵**

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Stewart

PA1000/1400/1800 Power Amplifiers



- High frequency switch mode power supply fully charges 12000 times per second (1000x faster than conventional power supplies) requiring far less capacitance for filtering and storage
- High speed recharging also reduces power supply "sagging" that affects other designs
- increbly efficient 5 PA-1000 or PA-1400's (4 PA-1800's) can be run on one standard 20 amp circuit. There is no need for staggered turn-on configurations or other prevention measures when using multiple amp set-ups, as current draw during turn-on is only 6 amps per unit.
- They produce smooth and uncolored sound, while offering very full detailed low end response and tons of horsepower. They each carry a 5-year warranty on parts and labor.

PA-1000 weighs 9 lbs., is 15" deep and occupies one standard rack space. Delivers 1000 watts into 4Ω when bridged to mono. PA-1400 weighs 16 lbs., is 15" deep and takes 2 standard rack spaces. Delivers 1400 watts into 4Ω when bridged to mono. PA-1800 weighs 17 lbs., is 17" deep and takes two rack space. Delivers 1800 watts into 4Ω when bridged to mono.

Performance Series Amplifiers



Performance Series 1 300 Watt Power Amplifier

- Measuring only 3.5 inches high and weighing 26 pounds, the Series 1 delivers more than 150 watts per channel.
- Its welded steel chassis is unbelievably strong while a custom heat sink extension provides exceptional thermal capacity.
- An internal fan provides quiet background noise levels for critical monitoring applications and when pushed hard the cooling system insures continuous cool operation even in the most demanding situations.
- Active balanced inputs with both XLR and 1/4" phone jacks.
- Supplied with quality 5-way binding posts for highly reusable speaker connection.
- Front panel handles are reversible for either rack mount installation or easy handling.
- LEDs are provided for signal presence and clip indication; the detented gain controls have large knobs for easy front panel adjustments.

Performance Series 2 600-Watt Power Amplifier

- Same as above except the Series 2 weighs 32 pounds and delivers more than 300 watts per channel.

Performance Series 4 1200-Watt Power Amplifier

- Same as above except the Series 4 weighs 53 pounds and delivers more than 600 watts per channel.
- Has a switch selectable clipping eliminator that prevents damage to the speakers.

TANNOY

System 6 NFM II

A 6.5 inch Dual Concentric with Tullio HF wave guide forms the heart of the System 6 NFM II providing a reference single point source monitor in a more compact enclosure than ever before. Every aspect of design fully complements the driver unit's capability. The rigid cabinet with carefully contoured baffle and trim minimizes diffraction and the high quality minimalist DMT crossover and gold-plated Bi-Wire terminal panel optimize the signal path. Pin-point stereo accuracy with wide frequency response, good power handling and sensitivity make this an ideal nearfield monitor.



PBM Series II Reference Monitors

The PBM II Series is the industry standard for reference monitors. They feature advanced technologies such as variable thickness, injection molded cones with nitrile rubber surrounds and the highest quality components including polypropylene capacitors and carefully selected inductors. With a Tannoy monitor system you are assured of absolute fidelity in the source, true dynamic capability and most important, real world accuracy.

PBM 5 II

- Custom 5" injection-molded bass driver with a nitrile rubber surround for extended linearity and accurate low frequency reproduction. They are better damped for reduced distortion and exhibit more natural spin and detailed midrange.
- Woofer blends seamlessly with the 1/4" polydome soft dome ferro-flo cooled tweeter providing extended bandwidth for extremely precise socially-balanced monitoring.
- Designed for nearfield use, the PBM 5 II cabinets are produced from high density mdfite for minimal resonance and features an anti-diffraction radiused front baffle design.

PBM 6.5 II

- Transportable and extremely powerful, the PBM 6.5 II is the ideal monitor for almost any project production environment.
- 6.5" low-frequency driver and 3/4" tweeter air led by a completely redesigned handwired hand selected crossover providing uncompromised detail, precise spectral resolution and flat response.
- Fully radused and ported cabinet design reduces resonance and diffraction while providing deep linear extended bass.



PBM 8 II

- High tech 1" soft dome tweeter with unmatched pattern control and enormous dynamic capability. 8" driver is capable of powerful bass extension under extreme SPL demands.
- Hard wired crossover, features true 14-wire capability and utilizes the finest hook power polypropylene capacitors and components available.
- Full cross-braced matrix metal structure virtually eliminates cabinet resonance as a factor.
- Ensures precise low frequency, tuning by incorporating large diameter port featuring laminar air flow at higher port velocities.



TURTLE BEACH SYSTEMS

Turtle Beach audio cards bring true studio performance to the PC platform. Based on the technology used in their professional products, the performance of both their hardware and software has garnered accolades from users and press alike. Unlike other PC-based audio cards, Turtle Beach products are not designed for sound card game compatibility. Instead, the design philosophy is to give the best possible performance and quality in the Windows operating environment, while bypassing traditional PC limitations.

MULTISOUND MONTEREY Multimedia Sound Card

The next generation of Turtle Beach's award winning Multisound card, Monterey offers high quality performance and features at a very reasonable price. Multisound's Hurracane technology provides very high speed audio data transfer between the card and the hard drive. This approach allows for data throughput up to eight times faster than the more common DMA designs, while putting minimum burden on the CPU (critical if you're recording audio and video simultaneously).

- The Motorola DSP56601 Digital Signal Processor operates at 20MIPS and performs all digitalization functions with very low system overhead.
- High SNR (-89dB, A weighted), low distortion (-0.01% THD, <0.01% IM - both A weighted), flat frequency response (DC-19KHz @ 5db).
- On-board real-time effects processor for a variety of effects, including reverb and echo.
- Professional quality MIDI synthesizer with wavetable playback (4MB of real instruments audio). Up to 4MB of standard SIMM-type memory can be added for sampling of new sounds.
- True 16-bit recording, using 64x oversampling and sigma-delta conversion technology.
- True 16-bit playback with 64x oversampling and sigma-delta conversion utilizing 18-bit DACs and an 8x intercoating filter.

WAVE 2.0

Professional Sound Editing for Windows 3.1 Compatible Sound Card

Wave is simply the best audio recording/editing/effects program available under Windows 3.1. With its logical layout, plethora of functions and wealth of effects, Wave will become an indispensable tool in your studio. Wave has the features (and more) which a tape recorder. It supports stereo or mono recording/playback at 11,025, 22,05 or 44,100 Hz sampling rates. And will work with any Windows 3.1 compatible audio board.

- Supports cut & paste editing (just like editing in a word processor) and has a fill function to eliminate fatal mistakes.
- Gain adjustment can be made for a whole file, or just the section you highlight.
- Wave can import and export a large variety of file formats, including SMP, SFI, WAV, 16-B and VOC. In addition, you can change the sample rate at previously stored files.
- EFX Clips function provides real professional effects, like distortion, flange, digital delay, reverb, auto-stutter and others.

- A four band parametric equalizer function (WaveEQ) gives you the ability to touch up sections of your audio as well as the whole file. You can easily correct flaws in the sound or go for the special effects.
- Speed control lets you adjust the playback rate of your recorded audio (up to 200% faster or 50% slower).
- You can mix up to three sound files into a new (fourth one), with control of volume and clamping time of each file.
- Glitches in the recorded sound can be repaired by simply drawing the correction on the waveform with your mouse.

QUAD STUDIO

Professional 4-Track Recording System

Quad Studio is the first real-time four track recorder for the PC. Now you can record two tracks directly to your hard drive (15ms or faster), then record two more tracks while playing back the first two. With its high performance and ease of use, Quad Studio is the perfect replacement for a 4-channel mixer/cassette decks.

- Graphics interface emulates all common mixer/tape deck controls.
- Record, overdub, mix and bounce tracks in real time with no loss of quality.
- Previously recorded audio can be effects processed (using the optional Wave program) and then mixed.
- Includes Turtle Beach's high-performance Tannhi board.
- Software is also separately available for Monterey cards.

\$399



BEHRINGER

MDX 1000 Autocom Automatic Compressor/Limiter



- Incorporates an interactive auto processor for intelligent program detection. With the auto processor, the attack and release times are derived automatically from the respective program material - preventing common adjustment errors.
- The auto processor also allows you to compress the signal heavily and "musically" in dynamic range without any audible "pumping," "breathing" or other side effects.
- Provides both Attack and Release controls allowing for deliberate and variable sound processing.
- Switchable soft knee/hard knee characteristics. Soft knee is the basis of the "inaudible" and "musical" compression of the material. Hard knee is a prerequisite for creative and effective dynamics processing and for limiting signal peaks reliably and precisely.

MDX2000 Composer Interactive Dynamics Processor



- Powerful and versatile signal processing tool provides 4 most commonly dynamic control sections: fully automatic compressor, manually controlled compressor, expander and peak limiter.
- Innovative IKA (Interactive Knee Adaptation) circuit combines the "musicality" of the "soft knee" function with the precision of the "hard knee" characteristics. Provides subtle and "inaudible" compression of the sound allows creative dynamics processing and release times. There is also manual control.
- Interactive Ratio Control (IRC) expander eliminates "chatter" on or around the threshold point.
- Interactive Gain Control (IGC) Peak Limiter combines a clipper and program limiter. This allows for "zero" attack, distortion-free limitation of signal peaks.
- IGC is invaluable in live applications: semi-balanced inputs and outputs. Operating level switchable from -10dB to +4dB.

PEQ305

Studio Parametric The Musical Equalizer

- Five independent, switchable bands. The quality of each of the five frequency bands can be modified gradually from match to broad-band characteristics. This offers more flexibility than any graphic equalizer can provide.
- Bands 1 and 5 are switchable between shelf and peak. This is extremely useful, since acoustic problems usually occur in the upper and lower frequencies.
- Utilizes the "Consistent Q" principle to eliminate interaction of the parametric frequency, bandwidth and amplitude. The same applies to interaction between the individual frequency bands.
- Parallel arrangement of the individual filter - reduces phase shifting and associated delays to a minimum.
- Polytometer response follows human hearing characteristics.
- Relay-controlled hard bypass with auto-bypass function during power failure.

DEQ8000 Ultra-Curve 31-Band Digital Graphics Equalizer/Analyzer

The DEQ8000 is an innovative programmable graphic equalizer/spectrum analyzer built with digital technology. A two-channel unit, it features Burr-Brown 20-bit A/D and D/A converters for input and output. It achieves the dynamics and audio quality of analog equipment while avoiding the drawbacks of analog filters such as tolerances in components.

- Programmable two-channel equalizer with 31 graphic bands on digital basis.
- Filter settings are displayed either in the form of display slide controls or as a filter curve representing the actual frequency response and taking the influence of several adjacent filters into consideration.
- Shelving function makes the moving of groups of faders possible.
- Up to 3 additional notch filters can be used whose frequency and bandwidth is freely selectable.
- Search and Destroy function automatically detects resonant frequencies, thus acting as an automatic feedback suppressor.
- The integrated Real Time Analyzer feature, both peak and RMS weighting, a noise generator with a separate output and a broad selection of auxiliary functions such as variable integration time, peak hold, etc.
- In Analyzer mode, a cursor is used to poll the amplitude of the single bands with an accuracy of 25db.
- The signal source (measuring microphone or equalizer input) fed into the analyzer input is freely selectable.
- Various analyzer measurements can be saved and recalled for reference purposes.
- Auto EQ mode combines the analyzer with the equalizer section and thus allows for the automatic equalization of acoustic environments. Within 0.5 seconds, the Ultra-Curve provides a linear frequency response based on the actual room acoustics.
- MIDI interface allows for selecting memory locations from and external MIDI controller. Remote control of all Ultra-Curve parameters can be realized via system exclusive information. All special units can be linked together via MIDI.

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ACROSS THE BOARD

continued from page 154

matter how fast or slow you play or search, the video is right there.

The Digital Atomics Rubidium Plasma Atomic Master Clock was a big hit. Apogee displayed its new 8-channel Apogee converter package. It looked like something out of the cockpit of a Boeing 777. Sony had a new reverb, the DPS-V77, that combined all of the best features of the D-7, M-7, R-7, and some of the other ?-7 units. From what I could tell at the show, it sounded pretty good.

E-Magic's Logic Audio looks like it is going to be pretty hard to beat. This software package includes MIDI sequencing and 12 tracks of digital audio. It includes some interesting digital audio quantizing features that work very well. It is worth looking in to.

Studer has a new CD recorder based on a new Philips engine. It can record audio CDs from an AES or S/PDIF input, or from a SCSI connection to your computer. When fed via SCSI, the discs can be cut at 2X speeds. You can connect two recorders together and make 2X copies from one CD to another. When recording CDs from the digital audio


input, DAT start IDs are automatically converted to CD track indexes without an external box.

There were so many great new products that I can't even remember all of them. I'll update you as I refresh my memory.

OTHER COOL STUFF FOR XMAS

When I wasn't cruising the AES show, I was cruising the Sony Store on Madison Ave. and the Sharper Image store. I couldn't walk out of the Sharper Image without this new Casio digital still camera. It works like a video camera except that it only takes stills. The stills are stored in memory instead of film, and then downloaded to your computer. The camera itself has a 1.8-inch color LCD that serves as the viewfinder during picture taking and as a playback screen. The camera comes with software for PC and Mac, a cable for connection to your computer, and a cable for playback on your TV set or printing the pictures on a video printer. Run to your closest Sharper Image or Wiz and check this little puppy out.

At the Sony Store I made the mistake of looking at video cameras. It is all over for VHS and Hi8. Consumer Digital Video is here. Sony has two cameras that record in the digital video format. One of them has a single CCD chip for all three colors, and the other one has three separate CCD chips fed by dichroic prisms for over 410,000 pixels of color resolution. This means better than 500 lines of horizontal resolution. The camera also records the audio as stereo digital audio at 12 bits, 32 kHz sample rate. Not CD quality, but better than the audio on most other video formats. The cameras also have digital video in and out for editing to another digital video deck. Oh, yes, frame accurate timecode as well as all of the camera settings are recorded on the tape along with the video. The tapes are smaller than Hi8 tapes and contain 6 mm tape. A friend of mine who works with broadcast video equipment says the picture quality is equal to or better than professional Digital Betacam. Well, there it is. You can now do all of your band videos in your project studio, too. A virtual one-person MTV.

I am running out to the 24-hour Santa Claus store to get a bigger stocking for my fireplace just in case Santa wants to trade me a Sony DCR-VX1000 camera for a couple of backstage passes to the next Steely Dan tour. 

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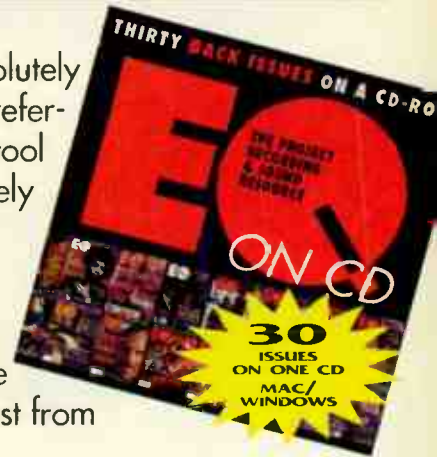
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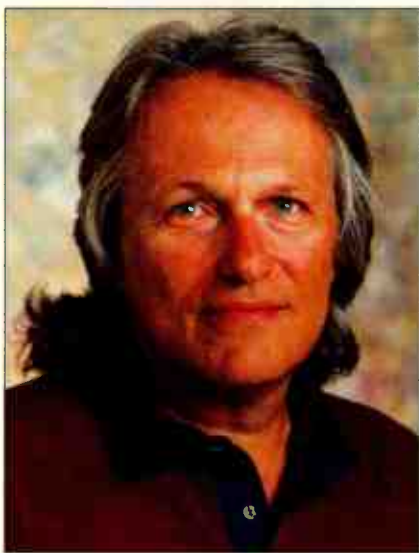
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The World's Shortest Tour



Steely Dan takes Manhattan

BY ROGER NICHOLS

It is very expensive to put together a tour when the band consists of 13 members; the crew totals more than a dozen and it takes more than two 40-foot semi trucks to carry the gear. When Steely Dan toured in '93 and '94, the managers figured that the tour had to last six weeks before the per-show rehearsal and travel costs came down to a reasonable amount. If you buy a new car, drive it across town and then sell it, the total cost of the trip becomes very high.

The Steely Dan live album just hit the streets, and the record company wanted to do some promotion. They

booked Donald and Walter on *The Late Show with David Letterman* for Friday, November 21st. Originally the plan was to use the Paul Shaffer Band with just Donald and Walter. That plan lasted almost 60 seconds. It wouldn't be in keeping with the Steely Dan tradition if the plan remained that easy. The only way to do it right would be to assemble the entire touring band for the five minutes on national television. The record company executives looked like they were choking to death on 100 dollar bills.

Yup, the Steely Dan way to do the Letterman show had to be the whole band. Soon after the ball started rolling, Donald and Walter were invited to be on the Album Network, a nationwide radio show carried by a few hundred FM stations around the country. They were just going to interview Donald and Walter and play some cuts from the live album. Definitely not the Steely Dan way to do things. It was decided that as long as the band was getting together to do the Letterman show, why not do four or five songs live on the radio broadcast? Make it so! To round out the tour, and possibly help pay for some of the expenses, Steely Dan also performed two shows at Roseland in New York City.

Rehearsals were Saturday, Sunday, and Monday. On Tuesday the show was dismantled and moved to Manhattan Center for the radio broadcast. The auditorium held about 300 drooling radio contest winners and close friends (some of them were drooling, too). There was a control room overlooking the stage that contained a 56-input SSL 4000G with Ultimotion moving fader automation. Basically, a studio environment for mixing the live tunes live to satellite uplink. It took all day to set up the stage, and the band played five songs. We even had the lighting company from the tour, which made the Steely Dan Album Network show go down in history as the best lit radio show on record.

On Wednesday and Thursday we were back in rehearsal for the Roseland shows. Friday we moved everything over to the *Late Show* stage. They had to build extra rolling risers to fit the whole band on the stage. Soundcheck went flawlessly. I was down in the audio control room

ogling over the billion-input SSL and Sony digital multitrack that are used for every show. The multitrack is there in case you want to remix the music between taping the show and air time. I didn't elect to remix; it sounded fine the first time. I have had 20 years to practice mixing the one song Steely Dan performed on the show.

The *Late Show* turned out great. Michael Delugg, the audio mixer for the show, let me help with the mix. It was really a test to get all of that music to fit through one Auratone speaker in mono. The show is broadcast in stereo, but the lowest common denominator is still the mono TV set. This is actually the first time I have listened to any mixes in mono since about 1978. I thought everybody except Phil Spector forgot about mono. I stayed up late enough Friday night to watch the Letterman show to see if the mixes came out all right. The fact that Sigourney Weaver was on the show with Steely Dan had nothing to do with it.

The end of the one week tour was quickly approaching. On Saturday and Sunday, Steely Dan performed two shows at Roseland in Manhattan to a crowd of about 3000 each night. It was standing room only. The normal stage wasn't big enough, so we constructed a stage at one end of the dance floor area at the long end of the room. The lighting company from the summer tours came in to light the show, and Clair Brothers did the sound. Just like a real show. Everything turned out fine and we concluded one of the world's shortest tours. There were actually more rehearsals than there were shows.

LEFTOVER AES STUFF

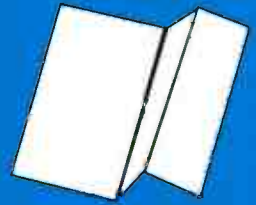
I think that the 1995 AES Show had the most cool stuff of any AES show ever. The new Alesis ADAT XT was amazing. Time-Line showed an 8-track magneto optical (MO) recorder that leaned toward film and video postproduction audio. Fairlight showed a 24-track MO recorder that recorded all 24 tracks on a single MO drive. Rourke Data had a video recorder that used MO for storage. The playback of video could now follow audio with perfect synchronization. When you scrub the audio, the video scrubs with it — no

continued on page 152

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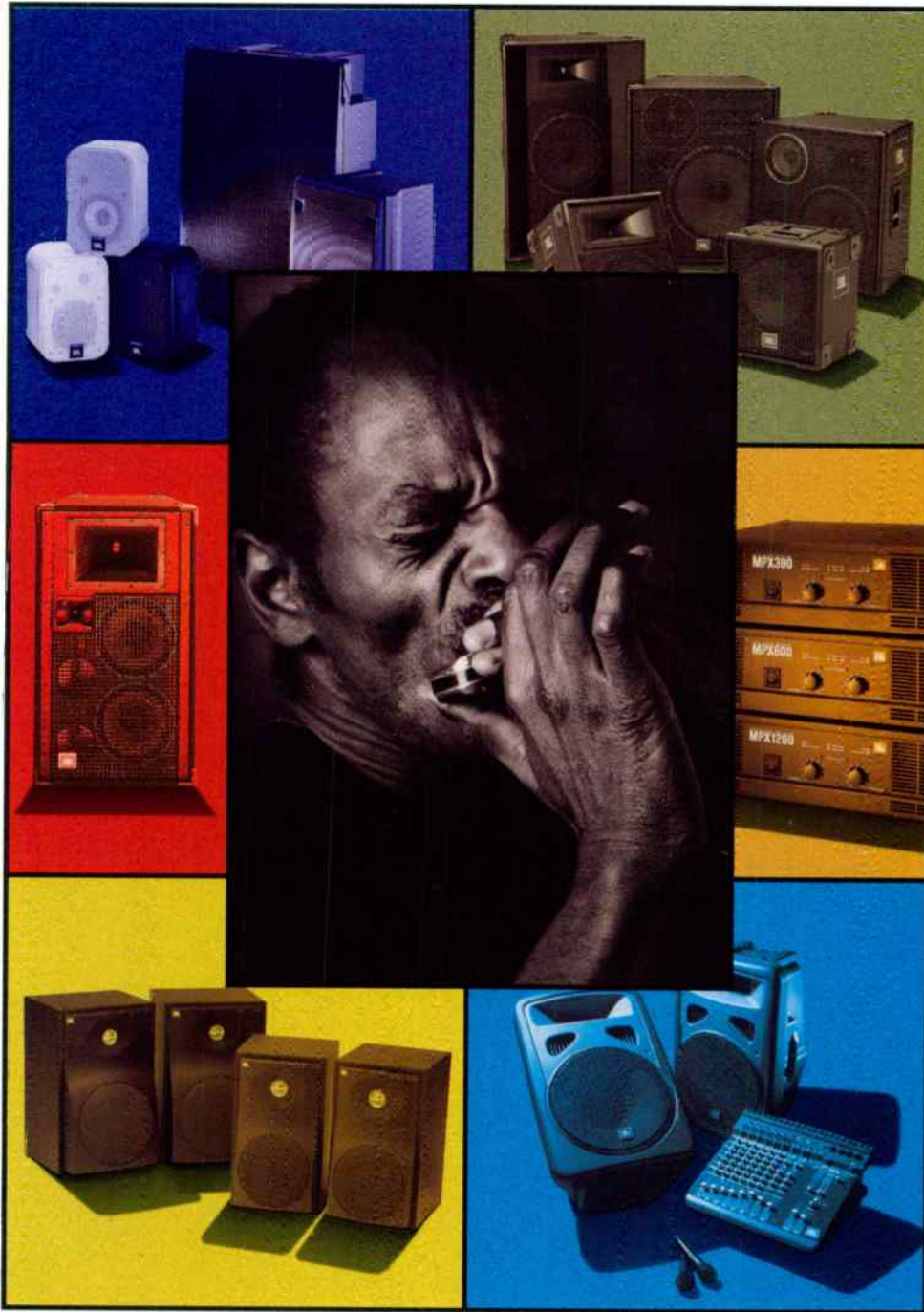
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