Radio World®

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Spectral Manipulation—Is It Needed? Studio Sessions, p.11


# CCIR Postpones Decision On World DAB Standard

**by Alex Zavistovich**

**LOS ANGELES** The International Radio Consultative Committee (CCIR) has deferred making a decision on a single worldwide digital audio broadcasting (DAB) standard, owing in part to a demonstration of USA Digital Radio's Project Acorn in-band system.

According to NAB Engineer Ken Springer, chairman of the U.S. delegation to CCIR Working Group 10B, the demonstration and papers presented by USA Digital at the group's meeting in Los Angeles Jan. 14-16 ended a standoff between the U.S. and its counterparts in the European Broadcasting Union (EBU). Any further discussion of a world standard has been tabled until October, Springer added.

CCIR Working Group 10B was formed to coordinate the implementation of a worldwide standard for terrestrial DAB.

Springer said 40 to 50 papers were presented at the working group meeting. Ten of those came from the U.S., including information on multipath and presentations from in-band, on-channel system proponents.

A great deal of discussion at the meeting was focused on whether technical standards can be adopted worldwide, to provide for a "commonality of equipment." During these discussions, the EBU proposed Eureka 147 as the single unique standard for DAB.

This was not the first time the EBU put forward the Eureka 147 system as a standard. Shortly after WARC, the EBU first tried to recommend Eureka for standardization. Because of resistance to that proposal, however, a paper was adopted, detailing requirements for a worldwide DAB system. Eureka 147 was attached to that paper as an example of a system that met all the requirements.

At the Working Group 10B meeting, Springer said, "virtually every country supported adopting the Eureka system as the standard" except the U.S. According to Springer, the U.S. position was that selecting any system as a standard is still premature.

"Eureka is a good system; no one disputes that. But there are other systems out there. Not everyone will be using L-band or other new spectrum," Springer said. Earlier in January, the NAB Radio Board formally adopted in-band, on-channel technology for digital audio broadcasting in the U.S.

What followed at the CCIR working group meeting was "essentially a standoff between the U.S. and the EBU delegations," Springer said. He credited actions

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# Consumer Audio Companies in No Rush to Make AMAX Radios

**by John Gatski**

**LAS VEGAS** Although there was a lot of excitement about RDS radios at the Winter Consumer Electronics Show (WCES), you couldn't say the same about AM stereo or AMAX-standard radios.

Few were found on the show floor and several manufacturers gave the "come on, get serious" look when asked whether they intend to put AMAX products on the market.

Remember the fanfare surrounding AMAX—the voluntary National Radio Systems Committee (NRSC) AM tuner standard—in late 1990? The standard included a 50 Hz-7.5 kHz frequency response, switchable bandwidth, noise blanking, and external antenna connection. AMAX stereo has a separate designation, but must meet the same specs.

The standard's intent was to give manufacturers a benchmark to shoot for when designing AM tuner sections. In recent years, AM tuners have been criticized for telephone-like sound quality. Manufacturers maintained such reduced performance specs were necessary because of overcrowding in the band.

### AMAX promotions

In 1991, the NAB planned a cycle of national AMAX promotional spots to be aired free by AM stations; local stations were supposed to work with electronics stores to push AMAX. Stations aired the AMAX promotion spots, according to the NAB, but the effort has not paid off in terms of making radios available to the public.

An informal survey of the show floor revealed only one AMAX radio: the Denon TU-680 NAB "super tuner," a unit commissioned by the NAB. The NAB demonstrated the TU-680 at its "Take the AMAX Challenge" booth, and Denon exhibited the tuner among its WCES products. Delco also builds several AMAX car receiver models, but they were not displayed at the show.

A Panasonic spokesman said consumers are not demanding AMAX radios. John Marino, NAB manager for regulatory and technical affairs, called the lack of AMAX products "frustrating" to the association's AMAX Committee.

"It's been an uphill battle," Marino said. "A lot of them (broadcasters) believed the product would be there."

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# NEWSWATCH

### Self-Inspection, FM Diversity On NAB Radio Board's Agenda

**NAPLES, Fla.** Besides its pro in-band DAB stance, the NAB's Radio Board took action or heard discussion on several items at its 1993 winter meeting, including FCC self-inspection forms, the Arbitron ratings service and FM diversity antenna technology.

The Board voted against use of the FCC's proposed self-inspection forms, calling it "a lot of extra work that doesn't do any good," according to NAB Science and Technology Senior Vice President Michael Rau.

The Board advocated "strong support" for use of diversity technology to lessen effects of FM multipath.

The Board heard a presentation from Arbitron and discussed methods for improving audience measurement.

### IDB to Distribute DMX in Europe

**WASHINGTON, D.C.** IDB Communications Group is the first customer to sign up for COMSAT's Digital Audio Distribution Service.

According to COMSAT, IDB will provide 72 MHz capacity on INTELSAT VI to International Cablecasting Technologies, which will distribute the cable audio service Digital Music Express (DMX) to Europe. The service is scheduled to begin March 15.

### Westwood One Introduces Audio Products Division

**LOS ANGELES** Westwood One Companies has created an Audio Products Division in an effort to capitalize on its existing audio archives.

With Joe Garner as director of the new division, Westwood plans to develop new business by creating licensing opportunities and marketing audio products for retail sale.

Westwood's archives include concert tapes, programs, interviews as well as the talents of Westwood personalities, programming concepts and production facilities. The division's first project already is underway.

### Westwood One To Sell WYNY-FM

**LOS ANGELES** Westwood One recently announced it would sell New York station WYNY-FM to Broad-casting Partners Inc. for $50 million cash.

Westwood One bought the station in 1988 for $39 million, but decided to sell the station to "continue the process of reducing the financial leverage of Westwood One...," according to CEO/Chairman Norman Pattiz.

### Indecency Ban Hours Established

**WASHINGTON, D.C.** In late January, the FCC adopted a regulation to establish times that indecent programming cannot be broadcasted. The rules state that indecent material is prohibited from being broadcast from 6 a.m to 10 p.m. for public

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stations that sign off at midnight; and 6 a.m. to 12 a.m. for all other broadcasters.

### AWRT Honors New Members of Congress

**WASHINGTON, D.C.** American Women in Radio and Television Inc. hosted a reception for new members of the 103rd Congress on Feb. 2.

Masters of the ceremonies included ABC and NPR reporter Cokie Roberts and talk show host Jenny Jones. The event has been held biennially since 1967.

### Stations Fined for Unauthorized Construction

**WASHINGTON, D.C.** License and renewal hearings have been scheduled for six stations controlled by T. Kent Atkins, and three of the stations have been fined $250,000 for unauthorized construction and other rule violations.

According to the FCC, "an investigation revealed that he (Atkins) constructed and operated without appropriate authorization non-commercial, educational stations KLMN-FM (Amarillo, Texas), KAMY-FM Lubbock, Texas, and KENT-FM (Odessa, Texas)."

"In addition, he (Kent) apparently misrepresented the facts and/or lacked candor with respect to his activities by knowingly submitting fraudulent documents to the Commission," the FCC added.

Besides KLMN, KAMY and KENT, KRGN-FM (Amarillo, Texas), KOJO-FM (Lake Charles, La.), CPs for a new station in Stanton, Texas and assignment of CP for KBTT-FM in Bridgeport, Texas also have been scheduled for hearings.

### Satellite DAB Could Ruin Local Radio, NAB Says

**WASHINGTON** In a recent speech to the Louisiana Broadcasters Association, NAB CEO Eddie Fritts warned that FCC authorization of satellite digital audio broadcasting (DAB) will destroy local radio.

Fritts said that allowing one satellite (DAB) provider to control 30 or 60 channels in a market "would represent a dramatic departure from the Communications Act's foundation principles of localism and diversity..."

The NAB opposes pending FCC applications for satellite digital audio service by five companies.

### WSUC Fined for Indecency

**CORTLAND, N.Y.** The FCC has fined WSUC-FM (State University of New York) $23,750 for allegedly violating the FCC's indecency policy.

Although base fines for indecency are $12,500, "the egregious nature of the material exacerbated the violation," the FCC said.

The broadcast "described sexual activities and organs in patently offensive terms...," the FCC explained. "Because it aired at mid-afternoon, when there was a reasonable risk that children may have been in the audience, it is legally actionable."

# Satellite DAB Proposals Filed

**by John Gatski**

**WASHINGTON** Four additional digital satellite radio system companies recently filed applications to launch new services, joining Satellite CD Radio, which filed an application earlier in 1992.

The latest proponents are: American Mobile Satellite Corporation (AMSC), Washington, D.C.; Digital Satellite Broadcast Corp. (DSBC), Washington state; Texas-based Loral Aerospace and Primosphere, a California company. All are seeking S-band allocations at 2300 MHz, based on the last year's World Administrative Radio Conference (WARC) allocation requested by the U.S government.

AMSC is proposing a mix of subscription and advertising-based channels transmitted via two satellites at 2340-2355 MHz with 11 CD-quality channels, five FM-quality channels, five FM mono-quality channels and one digital data channel.

DSBC plans call for 16 channels of digital audio to be beamed to 31 regional areas in the U.S. An equal number of channels will be reserved for mobile, portable and fixed receivers, according to the company's proposal. The funding mechanism includes some subscription and some advertiser-supported channels, according to the company.

Loral Aerospace's proposed service is all subscription, with 32 channels to be beamed to fixed, portable and auto receivers. It is asking for 6 MHz at 2355 MHz.

Primosphere's proposal is an advertising-supported service delivered by two satellites. It will offer 23-channels of "near" CD-quality audio to fixed, portable and auto receivers. Six lower quality additional channels will be reserved for non-music programming. Primosphere is seeking the upper 25 MHz of the S-band.

An ardent opponent of Satellite CD Radio's proposal being approved before broadcasters have a digital radio allocation, the NAB said it is scrutinizing the latest applications. At press time, however, the broadcasters' association had not issued any statements.

With regard to satellite digital broadcasting in general, however, NAB Science and Technology Engineer Ken Springer said, "NAB has a clear policy that broadcasters should have the first opportunity to provide digital audio broadcasts to the public."

The latest applications were filed by the Dec. 15, 1992, deadline to be considered along with Satellite CD Radio. A Jan. 15 filing extension also was granted for additional applicants.

# King's Night at Duke's

**by Alex Zavistovich**

**WASHINGTON** If I live to be a hundred years old, I don't think I'll ever see sights like the ones I saw Thursday, January 28.

The event was a congratulatory party for Larry King on the occasion of his last evening talk show for Westwood One's Mutual Radio Network. It was held at Duke Zeibert's, a favorite watering hole for the super-trendy, the glitterati and the power brokers in D.C. The back part of the restaurant was transformed into a makeshift remote studio for King's farewell late night show. The following Monday he began his new midday schedule.

Anyway, there were all kinds of media celebrities on hand to press the flesh and schmooze their way into the wee hours of the night. It made for a surreal kind of scene, too. I mean, where else could you find Tiny Tim, the '60s icon of musical kitsch, bellying up to the bar for drinks beside Pat Buchanan, the arch-conservative icon of the radical right and Republican presidential hopeful in the '92 election? (That image alone was worth showing up at Zeibert's for; it'll be burned into my memory forever.)

Other media notables were also in attendance. There was John David, NAB's VP of radio; CNN's Gulf War hero/anchor Bernard Shaw; Westwood One czar Norm Pattiz, and more PR people and media journalists than you could shake a word processor at. Throughout the early part of the festivities, the King himself (that's Larry, not Elvis) was mingling with us, shaking hands and grabbing shoulders for the myriad of photo opportunities that presented themselves.

(Just to prove we were really there, I'm including a photo of my frighteningly large self looming ominously over Larry and **RW** Managing Editor Lucia Cobo. Man, I could be the newest balloon at the Macy's Thanksgiving Day Parade.)

Shortly after 11 o'clock, the real fun began, as Larry went on the air for his last time at night. Norm Pattiz was at his right hand and Miami Dolphins coach Don Shula was his first call-in guest. After that, the stage was set for a wide-ranging cast of characters to give Larry congratulations.

photo by Neshan Naltchayan

Larry King takes time out for a photo with yours truly and Managing Editor Lucia Cobo.

Don't get me wrong. It was fun, and it's a real milestone in the life of a broadcaster who has definitely had more than his share of career highlights. To call it a media extravaganza, however, would be a gross understatement. It was an absolute convention of reporters. But, being on deadline as I was, I had to be a stick in the mud and draw the evening to a close around midnight, contenting myself with hearing the rest of the show on the drive home.

An unsung hero in this whole scenario is Mutual's Jim Bohannon, who's taking over the evening slot for King. Not only is he pulling the late shift, he's still staying on to do his morning show, with a couple hour break in between. Add to that a little time before for show prep and a little time after to de-compress, and you can imagine what the man's work day is going to be like. I salute him. And congratulations to Larry King for finally getting a day job in radio after all these years.

★ ★ ★

It's been a few months since the NAB has done anything that's left me scratching my head, but one of the Radio Board's actions at its recent meeting in Naples, Fla. suggests that management simply has to talk to the engineering department more often.

The Radio Board voted against use of the FCC's proposed technical self-inspection forms. NAB Science and Technology Senior VP Michael Rau called it "a lot of extra work that doesn't do any good." At least in part because of the board's action, the FCC has withdrawn its request to have the Office of Management and Budget approve the forms.

Now, I'll agree that the self-inspections were a lot of work for engineers, but it's the kind of work that engineers are paid to do. And once it was done, the station was (theoretically) in compliance, and the engineer had a paper trail that showed a good faith effort to live by the regulations.

It was one of the FCC's last attempts to put education ahead of fines as a cure for stations being out of compliance with Commission technical regulations. Requests for copies of the forms flooded in to **RW** writer Harold Hallikainen (who exhaustively analyzed the forms in his column), so engineers seemed to like the idea. Engineers I spoke with myself liked the idea. And now it's gone.

Look, no one expected anyone to do the self-inspection, then write the FCC and say, "I'm deficient in the following areas. Please fine me accordingly." On the contrary, it would be a lot less expensive to have an engineer give his station a clean bill of health than to have an inspector do a once-over and possibly issue a fine.

This kind of short-term thinking really steams me. Talk about penny wise, pound foolish. Oh well, I guess that's life in the radio biz.

That's it for now. Tune in next time.

Alex

# READERS FORUM

If you have comments for Radio World, call us at 800-336-3045 or send a letter to Readers Forum (Radio World, Box 1214, Falls Church, VA 22041 or MCI Mailbox #302-7776). All letters received become the property of Radio World, to be used at our discretion and as space permits.

### Tower icing revisited

Dear RW,

Our engineers enjoyed reading the article "Preventing Ice Build-Up on Towers," in the Dec. 23, 1992 issue. However, several items need correction.

Because of strict federal regulations, the use of fluorescent lamps to check antennas is generally not practiced anymore. Also, the climber should not find "hot hardware" around an antenna element. Even if a climber is willing to sign a release, federal law prohibits the exposure to RF (ANSI regulations).

Current technology allows a safer environment for the climber and less legal liability for the station. When our firm installs a new station, line sweeping (FDR) and VSWR readings are recorded. This becomes the baseline reference for future readings. For existing stations a line sweep and return loss could indicate an impedance mismatch. "Hot hardware" can also be found by visual inspection because of coloring changes.

Overall, the article was very informative. We would suggest, however, Mr. Osenkowsky not mention fluorescent lamps and hot hardware in future articles. He would probably get a call from the FCC readers, if he hasn't already.

Jean Muehlfelt, Marketing
Broadcast Communications
New Glarus, Wisc.

*Editor replies: Federal law only limits exposure to radiofrequency radiation based on ANSI regulations, it does not prohibit such exposure. The ANSI regulation you mention is a time-averaged, sliding scale calculation based on the specific absorption rate of RF by the human body. It is a two-tiered standard, with different levels of RF absorption specified for general public and occupational exposure.*

*Although regulations require stations to power down to a level compliant with ANSI regulations when tower climbers are at work, unfortunately this is not always the case.*

### What the market is reading

Dear RW,

A note to thank you for publishing the article on our Automated Radio Profit Generator (RW, Jan. 20, 1993)!

To say the response has been amazing might be an understatement. The phone hasn't stopped ringing since—and we're scrambling to keep up.

Now we know what the radio market is reading—and how!

Your kindness and friendship are noted and appreciated.

Alan K. Fendrich, President
Radio Profits Corp.
Newport News, Va.

### AM stereo: the other side

Dear RW,

In your Jan. 6 editorial, you claim that "...there are just no valid reasons not to convert to AM stereo." Now, no one loves AM more than I do, but I must respectfully disagree.

AM—as a medium—is in a condition that's far worse than most of us realize, and its decline is proceeding exponentially. The listenership figures that were released even just a few months ago are no longer valid.

We've been hanging on the success of some major-market talk stations and a few other isolated cases (such as in the mountains, where FM has signal problems).

In truth, those major-market clears are living on borrowed time. The whole reason why they went to talk and religion is because FM had all the music formats sewn up. What are these AMs going to do when the struggling FMs in their market start jumping up on their "niche" formats?

Being radio buffs, we'd like to believe that people would keep listening to, say, a KDKA out of a sense of history, if nothing else. The unpleasant truth is that the average listener is not only ignorant of radio history, he/she couldn't care less.

Consider these examples:

1) Our group manages several radio stations in the southeast, so we spend a lot of time on the road. Naturally, we listen to a lot of radio while we're driving around.

Gene, our managing director, had complained for some time that his radio just wasn't picking up as well as it used to. So, when he put his car into the shop for some maintenance, he asked the shop owner to check the antenna connections while they were working on it.

When he picked the car up, Gene asked if they'd checked the radio. "Oh, yeah," the shopowner said. "Nothing wrong with it. Some idiot had switched it to AM." He shook his head and laughed. "Who listens to AM anymore?"

Gene, of course, prudently failed to mention that he was the "idiot" and that he managed an AM station...

This story wouldn't mean a whole lot if some kid had said that. But the shop owner was a middle-aged businessman (read: Potential Advertiser). More importantly, this is not the only story of this type that I've heard lately, and the number of such incidents has been increasing.

2) I also teach electronics, and I've regularly surveyed my students (ages 18-40) about their attitudes toward AM radio. I've got news for those who believe that AM stereo, coupled with a massive marketing campaign, will revive AM. My students know that AM stereo exists (some have even heard it.) They don't care. To paraphrase one response: It's two speakers' worth of static and noise for the price of one. No sale.

It's time to face facts. AM, with or without stereo, has gone the way of the steam locomotive and the coal lantern. We are engaging in the same futility as those downtown revitalization groups who think that a new coat of paint and some shrubbery will cause people to flood back into the inner cities with money. With very few exceptions it hasn't worked in their case, and it won't work in ours.

We have to stop fooling ourselves. We have to stop hanging hopefully on exceptions and start looking, with cold realism, at the medium in general. Exceptions do not a rule make.

Look again at how the CD stomped the LP out of existence. Not only did the CD eliminate the LP, it did so with a speed that astounded even the so-called industry "experts."

(Remember how they predicted that the LP would hang on for 10 years or more? Remember how, after just two or three years, the record companies had stacks of LPs rotting in the warehouses, and demand for new CDs was so high that the pressing plants were working three shifts a day?)

(And if you're waiting for receiver manufacturers to rush in with a new line of AM stereo radios, you might have to wait a bit. They had stacks of turntables rotting in those same warehouses. Add in the fact that they were burned on AM stereo to start with, and you see the problem.)

I see exactly the same situation developing with AM and the analogy fits: Re-introducing AM stereo would be almost as effective as re-introducing the quadrophonic LP. It's old news now, and no one cares.

So what do we do?

We have to come up with an alternative, and fast. Here's one vote for building a bonfire under the FCC to get DAB approved and on air before the end of '93. If need be, we should hogtie them and make sure they select one—and only one—system, too.

Given that we have DAB on the way, I'd like to see AM, and AM daytimers in particular, get first crack at it. Those little daytimers deserve it. They've hung in there for years waiting for relief, and it's time they got it.

But we need to quit promising them therapies that won't work. Forget AM stereo; forget the expanded band and improved antennas. They're a waste of time and money.

Let's focus our efforts on something that will work; if not DAB, then something else.

Stephen M. Poole, CET
Director of Engineering,
Carolina Radio Group
Raeford, N.C.

## A World Standard For DAB?

If U.S. broadcasters are serious about having an in-band, on-channel digital audio broadcasting (DAB) system and possibly exporting and licensing the technology, cooperation and progress domestically are more essential than ever. Otherwise, the European Broadcasting Union (EBU) may be able to persuade world broadcasters to adopt the Eureka 147 system as the standard.

At a recent meeting of the International Radio Consultative Committee (CCIR) Working Group 10B, only the concerted effort of USA Digital Radio's Project Acorn developers prevented the EBU from steamrolling Eureka as a worldwide DAB standard.

Fortunately for U.S. interests, delegates to the working group from Japan and Sweden were sufficiently impressed by demonstrations of the Project Acorn AM and FM in-band systems — which most nations' representatives had never heard before — to recommend that the CCIR postpone any discussion of a worldwide DAB standard until the group's next meeting in Geneva in October.

Domestically, broadcasters have been at odds with the Electronic Industries Association (EIA) over whether the EIA is the appropriate forum for testing DAB systems. USA Digital in particular has chosen to withdraw from EIA testing for a variety of reasons, including what they consider to be an under-representation of broadcasters in the voting procedure for the tests.

The latest news surrounding U.S. DAB testing suggests that both broadcasters and the EIA may consider the compromise of having the National Radio Systems Committe (NRSC) test in-band systems, while the EIA tests out-of-band systems. This compromise may relieve tensions surrounding the testing, but opens up other questions, such as whether there will be two U.S. DAB standards.

Regardless of how the dispute over testing is resolved, it must be done quickly, so as not to hamper progress in in-band on-channel development. The EBU is angling toward making Eureka the worldwide DAB standard, and has made two attempts to have it accepted by the CCIR. Its next attempt will undoubtedly be in October. If U.S. broadcasters are serious about in-band, they must be ready and able to counter that next challenge.

—RW

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**Next Issue of Radio World March 10, 1993**

**solution to Feb. 10 puzzle**

# Engineer Impressed by In-Band Demo

**by Marv Collins**

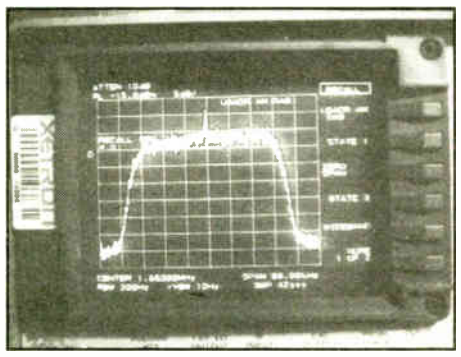
**LOS ANGELES** At a Jan. 15 meeting of the Society of Broadcast Engineers' (SBE) Chapter 47, those in attendance auditioned the USA Digital AM and FM in-band, on-channel digital broadcasting systems, known jointly as Project Acorn.

The SBE meeting was held in a Radisson Suites hotel room in nearby Manhattan Beach. USA Digital Radio also had set up receiving equipment in the hotel meeting room to demonstrate the Project Acorn system to the concurrent meeting of the International Radio Consultative Committee (See related story, p. 1).

Michael Callaghan, Chapter 47 chairman and chief engineer for Gannett's KIIS AM/FM, demonstrated the USA Digital in-band FM broadcast by KTWV-FM, on 94.7 MHz. The AM demonstration was on KNX, conducted by Michael Smith, the station's director of technical operations. Both demonstrations were similar to those at the NAB Radio Show in New Orleans in September 1992.

The Project Acorn FM digital signal is said to provide audio bandwidth up to 20 kHz and a dynamic range of 96 dB, as opposed to analog FM's 15 kHz limit and approximately 65 dB dynamic range.

Subjective listening tests of the Project Acorn FM system clearly showed the advantages of the digital signal. Several audience members said they could hear the extended frequency range of the digital signals. At the receive site, there was a little noise that could be heard during low modulation levels on the analog signal.



Spectrum analyzer display of 1660 kHz USA Digital AM DAB. Digital signal only, no analog amplitude modulation.

### Improved sound quality

The AM demonstration also showed the significant improvement in sound of the digital transmission over KNX's analog transmission. KNX uses the NRSC equalization curve which, with a receiver equipped with the NRSC de-emphasis curve, will give an audio pass band extending to 9 kHz.

USA Digital's system is said to provide 15 kHz stereo with a dynamic range of 96 dB, which makes AM DAB sound like a stereo FM station.

As explained to and observed by the SBE engineers, the FM in-band digital signal transmitted from KTWV was a combined analog and digital signal. The KTWV analog signal was transmitted from its normal facilities. A truck, which contained a solid state Harris television transmitter capable of digital audio transmission, was parked outside the KTWV transmitter building.

The digital FM signal began as a 192 kilobit MUSICAM bitstream which provides two 20 kHz stereo channels. An error coding and interleaving exciter brings the bit rate up to 400 kilobits. The digital signal requires linear amplification; class C amplifiers will not work.

The output of the television/digital transmitter, modified to work on 94.7 MHz, was fed into the KTWV building, and

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# ...And Another Who Wasn't

**by George Riggins**

**LOS ANGELES,** USA Digital Radio was in Los Angeles to do a presentation for the International Radio Consultative Committee (CCIR), so SBE Chapter 47 was afforded the opportunity to witness over-the-air demonstrations of the in-band, on-channel system that has been developed. At least they have something that seems to work.

The FM demonstration used the facilities of KTWV-FM, owned by Group W, while the AM demonstration used the facilities of KNX (1070 kHz), owned by CBS. The receiver was a first generation, converted Carver "box" for both the FM and AM signals. A second generation receiver is anticipated for demonstration at the spring NAB convention.

My personal impression as to the difference between the analog signal and the digital signal on the FM band has to do with what sounded to me like a rattling high frequency speaker cone and less low end boost. The AM signal also had the sound of a bad high frequency speaker, and sounded "tinny" to me. The mid-range (AM signal) sounded like some one talking to me through a long pipe—that is, a hollow sound.

Perhaps some of the audio problems I perceived were caused by the several analog-to-digital conversions that took place. I do not know, nor have any way of judging, other than to say that I get some of the same high end sounds from CDs played through my own sound system. I do not get that high-end rattling or tinny sound from analog tapes or records, so I feel that my tweeters are OK.

The speakers used for the demonstration had good brand names and should have been in good condition. I would like to hear more explanation.

In any event, a system was up and running, no matter what my opinion might be.

□□□

*George Riggins is author of* **RW**'s Old Timer *column.*

JONES SATELLITE AUDIO™
RADIO PROGRAMMING NETWORKS

November 25, 1992

Mr. Ron Oler
Harris/Allied Broadcast Division
3712 National Road West
Richmond, Indiana 47375

Dear Ron:

I wanted to express our extreme satisfaction with the Audio Metrics CD-10 compact disc players. In a national broadcast environment such as Jones Satellite Networks, we demand only the most reliable equipment with state-of-the-art performance. Jones Satellite Networks is known for the finest audio quality in the business, so we were not ready for any compromises.

My experience with other compact disc players (cart based and standard) created a concern for reliability. The CD-cart system was the only choice. We cannot afford any damage to our discs.

Other CD-cart players allow the talent to eject a disc as it is playing! The CD-10's eject inhibit during play feature is simple, and very effective.

After an extensive testing period, we have used the CD-10 players on the air for over six months. Without one skip! Our affiliates appreciate the digital quality, I appreciate the lack of on air "gliches".

The CD-10 is clearly superior to other units. I say this as I order another six players. Every type of broadcast equipment has a leader, and Audio Metrics leads the way into the next century with a first rate product.

Well done!

Eric M. Wiler
Jones Satellite Networks

8250 SOUTH AKRON ST., SUITE 205
ENGLEWOOD, COLORADO 80112
800.766.3251 FAX 303.799.0551

# Love Letter.

We've been telling you how great our Audiometrics CD 10 Compact Disc Cartridge Machine is. But you don't have to take our word for it.

Proof of a product's worth is in its performance. And these CD 10 machines outperform all others. We've sold more CD cartridge players than all other dealers combined. We know what we're doing.

The CD 10 is the natural evolution of a great idea. We simply made it better.

The CD 10 broadcast-ready CD player features cartridge autolock, programmable EOM indicator, instant start with music, and true broadcast standard construction.

The CD 10 won't let you mess up on the air. The cartridge is secure within the machine until you make a conscious effort to remove it.

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# Overtime, Ingenuity Bring RDS to 'Vegas

**by Dee McVicker**

**LAS VEGAS** Several days before the Winter Consumer Electronic Show (WCES), while some attendees were making last-minute travel plans, RE America's John Casey was making plans for a massive Radio Data System (RDS) "installathon."

Earlier, arrangements had been made by the Electronic Industries Association (EIA) to equip 10 Las Vegas stations with RE America RDS encoders to demonstrate RDS live during the WCES.

This event, which eventually kicked off a major media blitz heralding the new radio technology with write-ups in "The Wall Street Journal" and "New York Times" and media coverage by "Good Morning America," came on the heels of the newly adopted National Radio Systems Committee (NRSC) Radio Broadcast Data System standard, and encompassed most major receiver manufacturers.

On the floor of the convention center, RDS receivers by Blaupunkt, Delco, Denon, Kenwood, Onkyo, Grundig, Philips and Sony were waiting to exhibit format scanning, emergency alerts, traffic bulletins, and other RDS features.

Engineer Joe Sands at the KEYV-FM studio.

## Day one

The "installathon" began on Sunday, Jan. 3, three days before WCES opened on Thursday. John Casey arrived at the Las Vegas airport. In the next 72 hours, he would need to choreograph his time carefully to install RDS encoders at FM stations KEDG, KEYV, KFBI, KFMS, KKLZ, KLUC, KNPR, KOMP, KRRI and KYRK.

His first installation was at KFMS-FM. After being welcomed by Chief Engineer Keith Lamonica, discussions quickly turned to where to put the RE533, RE America's RDS encoder. With STL auxiliary inputs already in use for telemetry and for AM simulcasting, Casey suggested interfacing the RE533 to the station's Continental exciter as a dedicated SCA source.

That suggestion took the two to KFMS's transmitter site—at least an hour-and-a-half away atop the Black Mountain.

As twilight fell, the two negotiated the steep incline up the mountain in the station vehicle. Once inside KFMS-FM's transmitter building, a sample of the composite signal was taken from a monitor output on the exciter, providing the RDS encoder with a reliable sync source.

All was going well. The sync source enabled the RE533 to strip off the 19 kHz pilot for phase locking to the RDS subcarrier of 57 kHz, the third harmonic of the pilot frequency. Intermodulation distortion was not a problem.

Next, output from the RE533 encoder was connected to an open AUX/SCA input on the rear of the exciter, and Casey interfaced a portable PC to the encoder through an RS-232 port for setting the signal injection level. He gradually brought the signal up until the injection level reached approximately 3.5 percent of the main signal. The KFMS installation was complete. Total time: less than 15 minutes.

Celebration was short-lived, however, when Casey and Lamonica tried to monitor the RDS signal on a Delco receiver brought along for this purpose. The receiver, Casey recalled, "was temporarily D.O.A.," most likely due to the tremendous amount of RF around and within the transmitter building.

Luckily, KNPR Chief Engineer Gale Gilbreath had an RDS receiver. Casey called the engineer and asked him to monitor KFMS's frequency. He confirmed that the RDS receiver had blinked back with "KFM-102," KFMS's promotional signature, and was receiving other vital information for format scan, clock time, and a text message— all pre-programmed earlier.

Next, Casey headed to KOMP-FM where engineers Mark Nolte and Robert MacDonald were waiting. The installation there was completed in under 15 minutes' time.

Just before midnight on day one of the installation project, Casey came back down the mountain for some badly needed sleep.

## Day two

On Monday, Jan. 4, Casey was off to KKLZ-FM's studios for his third installation. He was on familiar turf; KKLZ had

continued on page 20 ▶

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Studio Sessions

Equipment and Applications for Radio Production and Recording

An Answer to a Frustrating DAT Problem, p. 14

LINE OUT

# Spectral Manipulation: Do We Need It?

**by Bruce Bartlett with Jenny Bartlett**

**ELKHART, Ind.** Should a radio station change the tonal balance of the recordings it plays? Is it OK to alter the amount of bass, midrange and treble in a recorded work to create a sound or a mood for your station?

In a letter I sent to **RW** late in 1992, I argued against spectral manipulation. I wrote, "Consider the people who make the CDs you're playing—the recording engineers, musicians, and producers. They work very hard to create a certain spectral balance on their CDs. Why tamper with it? You're second-guessing their judgment.

"I realize that the idea is to give your station a distinctive sound. But if you change the balance between bass, midrange and treble, the CDs you play will sound different than intended."

Our illustrious editor countered by saying that spectral manipulation is used to set a mood or to create a "signature" sound for the station. He offered the opinion, however, that adding EQ to prerecorded material broadcast by a radio station is, as an artistic issue, similar to the contoversy surrounding the colorization of black and white movies.

I, however, liken station EQ to changing the colors of a work of art. Imagine the publisher of an art book saying, "Let's emphasize the blues in our photos of Van Gogh's art works—reds aren't 'in' this year." Or imagine a station manager saying, "Nowadays, everyone pumps up the bass so their car stereo will really boom. Let's add more bass to all our rap records." But the listeners and record producers are probably doing this already.

Dave Stewart, a DJ from WPLJ-FM in New York, wrote in to add his point of view. He said that, if you don't use spectral manipulation, "you're letting the personal preference of each individual recording engineer and producer tailor the sound of your radio station. If there are a thousand songs on your station's playlist, then a thousand different people EQ your audio. They can't all have it right."

I appreciate Stewart's opinion. But if a DJ changes the sound of each record to his or her taste, you get one homogeneous point of view, rather than a pleasing variety of musical experiences.

Also, records are not made to give radio stations a "sound." Records are an artistic expression of the musicians' ideas and feelings. Musicians determine the tonal balance that they want the listener to hear. They decide whether the bass should be louder than the cymbals. They decide whether the sibilants in the vocals should sound sizzly or smooth.

But when you change the tonal balance, you change the loudness relationship among instruments, which changes the aesthetics of the music.

The job of a radio station, I think, is to be a simple messenger of the music. Originally, radio was meant to be a transparent, high-fidelity medium, faithful to the original. In this spirit, many classical music stations avoid EQ because their listeners love natural timbres—they know the sound of live music.

Please note that I have a prejudice in favor of honoring the integrity of the artist's product. Stewart's opinion as a DJ is equally valid.

In fact, if I were a DJ, I'd want to give my station a sound that stands out when listeners scan the dial. While driving out of town, I've flipped through the dial trying to find a loud, clear station with music I like. I've noticed that some stations have a really bright, punchy sound that gets my attention. At that moment, the sound matters more than the musical balance. I still enjoy the music, even though it's processed.

I can see how spectral manipulation should be no big deal. After all, a recording sounds different on every home or car stereo on which it's played. What harm can come from a little extra EQ at the station?

Well, if a station changes a recording's tonal balance, it will sound different on the radio than on a CD player at home. Suppose a recording has been beefed up to sound bright and aggressive on the radio. If listeners like that sound, they may be disappointed when they hear the same record on their CD players. They wouldn't get what they paid for.

On the other hand, listeners probably don't expect CDs to sound like radio. Many consider radio to be a sonically inferior medium, and look forward to improved sound when they play CDs at home.

As a musician, recording engineer/producer and former radio engineer, I can see all three viewpoints. Musicians want to reach the home listener with an artistic statement. Recording engineers and producers want to hear their sonic creations accurately replayed on the radio. Radio engineers want to sonically excite listeners so they'll tune in.

I suspect that musicians don't mind if their sound has been manipulated on the radio, as long as listeners want to tune in and hear the music. Once the listeners buy the recording, they can hear it pretty much as the musicians intended.

What is your opinion on spectral manipulation? I'd like to hear from you.

□□□

*Bruce Bartlett is a microphone engineer and technical writer for Crown International. Jenny Bartlett is a technical writer. Bruce can be reached at 219-294-8388.*

PRODUCER'S FILE

# Inside Korg's SoundLink

*Editor's note: This is the first in a two-part series on the Korg SoundLink digital audio workstation.*

**by Ty Ford**

**BALTIMORE** Almost anybody can hook a computer to a hard drive, call it a workstation and bring it to market. What you really want is a workstation designed by a company that understands how audio producers work—a company that understands what comes out of the speakers is more important than which files must be in which folder to make the system heap happy.

Enter Korg, a major player in the synthesizer market. Korg's SoundLink is a second-generation, full-featured, eight-track DAW, priced at $37,000. Included is an eight-track digital console with dynamic fader and snap-shot three-band EQ, pan and reverb/chorus automation. Throw in eight noise gates and high-pass filters and a stereo limiter/compressor, a 16-track MIDI sequencer, SMPTE capability, exabyte backup streamer and QWERTY keyboard, and there's no room left for the kitchen sink.

### Second generation DAW

I first saw the Korg SoundLink over a year ago at the AES show in New York. When I mentioned the SoundLink's striking resemblance to the AKG DSE-7000, the Korg people said that, in fact, they had looked very closely at the DSE-7000 during the SoundLink design stage.

There are, of course, notable differences. The DSE-7000 is arguably the easiest DAW for people used to operating basic radio station production gear. I position the Korg SoundLink technically as a step up. It's more difficult to use, but it does more and has more flexible I/Os. Because the DSE-7000 records into RAM and continuously backs up the project you're working onto its hard drive, all eight channels are always audible, and the scrubbing is incredibly smooth and tight.

The SoundLink is a hard drive recorder

The Korg SoundLink digital audio workstation

with a much smaller RAM buffer. As such, you don't hear audio during fast forward or rewind, and scrubbing is not as smooth. Based on my recent evaluations, the Korg scrub is smoother than the Dyaxis Lite, but not as smooth as the Pacific Recorder's Dawn-based workstation. For more precise editing and smoother scrubbing, SoundLink's edit screens provide for six levels of "zooming in" on the audio. There are six levels of zoom. The closer you get, the smoother the scrubbing becomes.

Korg obviously did its homework when choosing features to include in the SoundLink. At the top of my appreciation list is its use of a dedicated console. The SL100C console is packed with an eight-channel digital mixer with dedicated faders and input/output, record/play and automation controls, a master fader and a MIDI master fader, as well as transport controls, buttons to navigate the system and a scrub wheel. The meter bridge contains LED level indicators for each of the eight channels, stereo master gain and a back-lit LCD for viewing the audio, editing and parameter pages.

On the back of the console are two video outputs: NTSC composite video with time code window, and one without. This is the same video that feeds the liquid crystal display on the console and can be used to drive larger video monitors, giving you the "big screen" approach. You can also tweak the foreground and background colors of the main and time code displays on this output, as well as the sync polarity.

### Inputs and outputs

The SL100M main unit houses all of the I/Os. There are eight analog inputs and outputs. Each analog input and output is dedicated to one track of the hard drive. If this seems too restrictive, you can cut and paste audio from one track to another once it's recorded, or use a routing switcher or eight-track bus assignment buttons on an existing house mixer to place incoming audio on the desired track. There is also an analog stereo mix bus.

The SLM100M also has three stereo digital inputs capable of 44.1 kHz and 48 kHz: two SP/DIF RCAs and a AES/EBU XLR. Using the digital I/O screen, you can choose which of the three inputs you'd like to use and direct the stereo signal to any two of the eight tracks or directly to the master L/R bus.

There also are two digital outputs. Digital Output One allows you to choose between AES and SP/DIF output and copy prohibit status. You can direct any

continued on page 17 ▶

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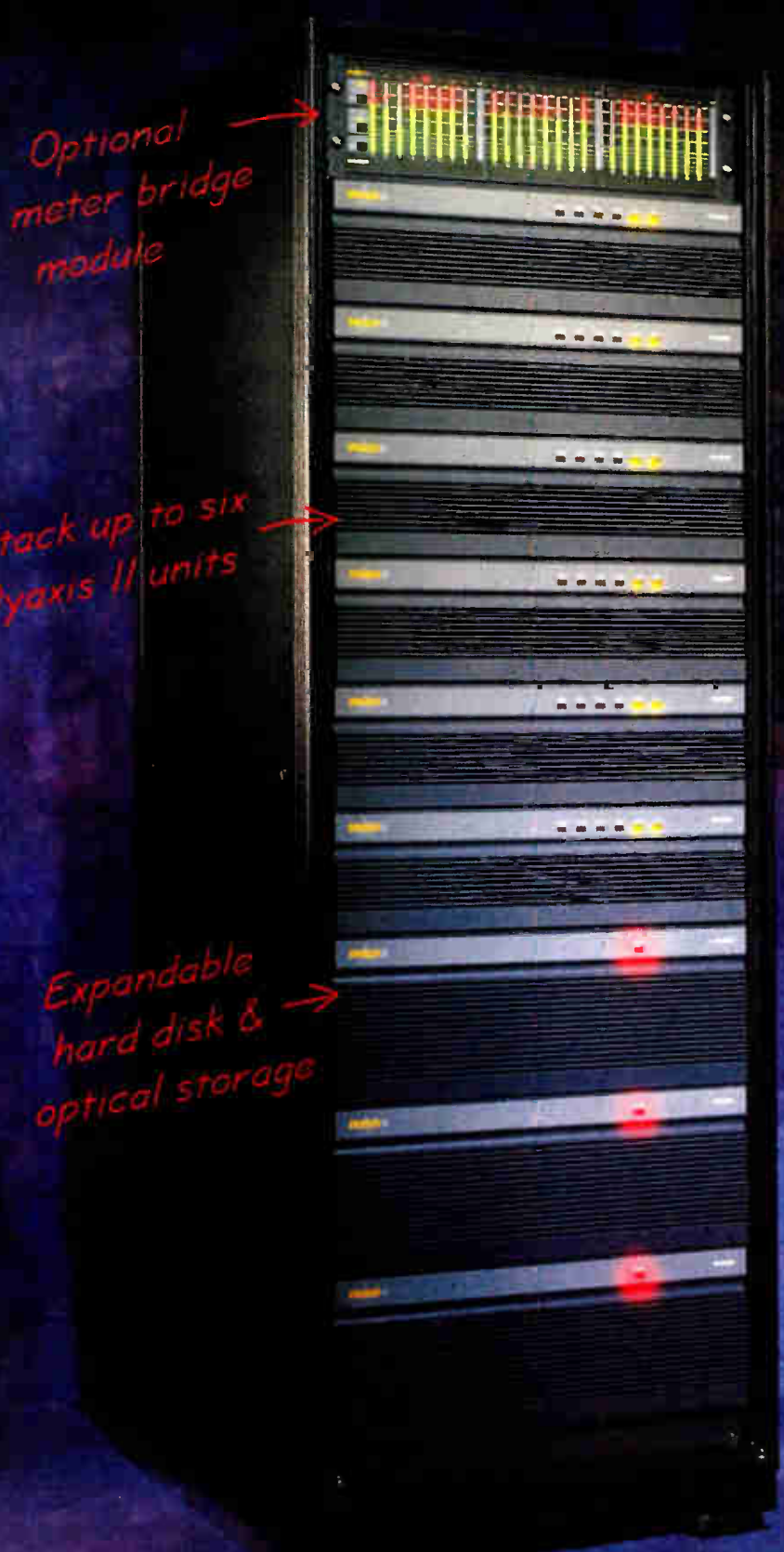




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ON THE SPOT

# Stereo Makes Ad Spots Come Alive

*Editor's note: This is the first in a continuing series of columns called* On the Spot, *addressing concerns in radio commercial production. If you have a story about a particularly challenging problem you've solved, or some other aspect of production you might find valuable to share with your peers, send it to* On the Spot, *c/o* ***Radio World****, 5827 Columbia Pike, Suite 310, Falls Church, VA 22041.*

**by Warren Miller**

**NORFOLK, Va.** I had this wonderful dream the other night. I dreamed that I got into my car, hit the ignition and was surrounded by stereo music. I hit the button for our local sports station just as the basketball players swept across my dash and slam-dunked the ball into my glove compartment.

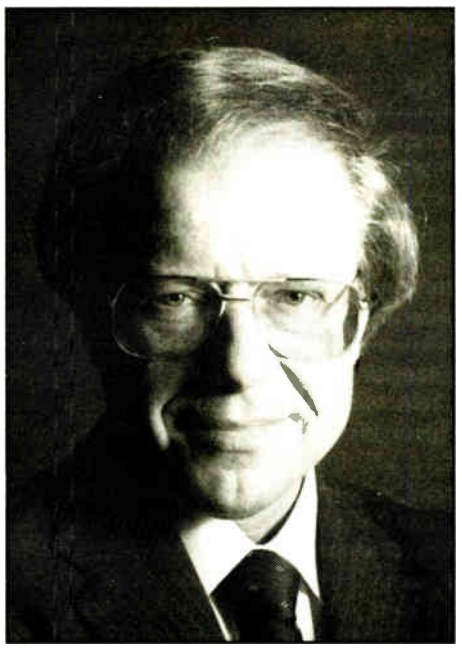
Can you imagine? I was *dreaming* about stereo radio in 1993! And it was a dream because radio just isn't utilizing its fabulous stereo potential. Sure, the music is in stereo. But have you ever heard (including TV audio) a local or network basketball game where mics had been positioned at either end of the court? Have you ever heard a morning team whose mics had been panned to various positions for depth, proximity and rapport, so the audience could get involved?

A typical station plays an equal number of spots and music cuts. Boy, does the station care how that music sounds. But as long as a commercial approximates a zero level, it's dandy.

### The pro-stereo argument

Would a station increase sales if its spots were in stereo? Sure. Not only because the spot would sound better to the client (whose ego often substitutes for a focus group), but it would generate more results. With stereo, the audience listens closer, becomes more mentally involved and develops a higher level of motivation.

Surprisingly, however, only about five percent of the 4,500 commercials our company produces annually are mixed and dubbed in stereo. So I suppose we could say that if the ad agencies (who we work for) don't care, why should the stations? Because ad agencies are in the *marketing* business, while broadcasters are in the *sound* business and should know better.



Warren Miller

The difference between mono and stereo production is reflected in about 25 percent more time in the studio. But what a difference it makes—provided a little imagination is used. And, please, we're not talking about one announcer coming out of the left channel and another out of the right. We're talking about movement...action... emotion. A thunderstorm is not threatening in mono. A grocery store is not busy in mono. They're merely loud.

In stereo, they move—at you, around you, over you. Suddenly the listener is a part of the commercial, not a passive spectator.

But what about the voices? Music and effects are either available in stereo or the producer designs the effects (doorbells, clock ticking, etc.) within a stereo mix. Handling the voices is the challenge.

### Designing the stereo

You can lay down the voices multitrack and design the positioning and movement within the stereo sweep using pan pots in the mix. Or, the action can be recorded live via matched mics. I favor the latter because the performers become physically involved in the action and their delivery reflects that action.

Even before the session, however, the director/producer needs to block out the script in a manner similar to TV directing. Read the copy, close your eyes and envision the scene. Then mark the copy to indicate where in the stereo sweep each voice or effect should be placed and what movement might be called for.

In essence, you're drawing a floor plan of a stage, fixing the location of actors and drawing arrows of movement. This whole process can take as little as 10 minutes, unless you're recreating the Civil War.

Next, set up your mics three to six feet apart (depending upon how wide the physical scene might be). Obviously, a couple of lovers are much closer together than two guys calling to each other from across the street. Keep in mind that our ears are only about seven inches apart. It's totally unnatural for a specific sound to come out of one channel alone, unless an actor is whispering in the listener's ear. Three to six feet is good mic placement to ensure everything reaches both mics to some degree and to make it rather easy for the performers to move from one end of the scene to the other.

### Act natural

Perhaps the most important element (which also applies to mono production, but is emphasized in stereo) is a natural delivery. We always tell announcers to talk to the microphone as if it were a friend sitting there. In acting for radio, the performers must totally ignore the fact that there are mics in the room. They must simply interact with one another.

And no announcers or actors should *ever* speak up. In live theater, actors have to play to the back row. But in radio, you're playing to the ears of your listeners—the microphones—which are right in front of you.

So give it a shot. Take the time to produce a couple of commercials and a couple of station promos in full stereo. You'll find a whole new dimension of creativity. You'll be hooked. And the station will sound great!

□□□

*Warren Miller is CEO and executive producer of Studio Center Broadcast Productions, creator and producer of radio and television commercials. For more information on Studio Center, contact the company at 200 West 22nd St., Norfolk, VA 23517; phone: 804-622-2111; fax: 804-623-5512; or circle* **Reader Service 46.**

# Adjusting Levels on the SV-3700

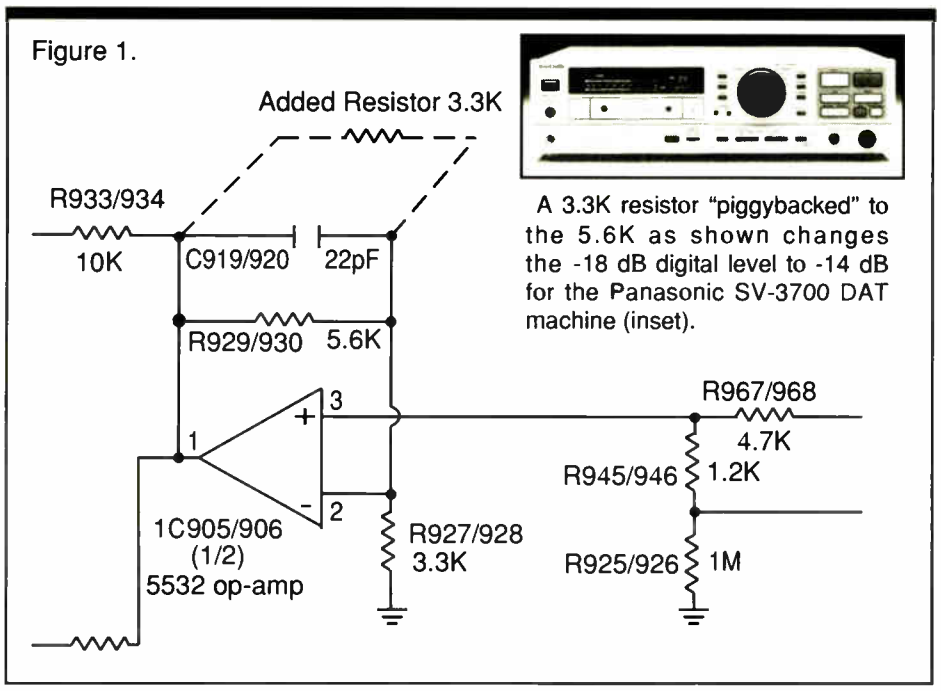
**by Richard P. Robinson**

**WALLINGFORD, Conn.** The Panasonic 3700 DAT machine is one of the most popular machines on the market today. Good sound quality, standard features, and an affordable price make it the machine of choice for many studios and stations.

A feature not mentioned on the spec sheet is the 3700's lack of audio glitches upon entering record mode from either stop or record pause, making manual assembly editing possible without the static between cuts that can occur on some other DAT machines.

One aspect of the machine can be annoying, however: the adoption of -18 dB digital level as +4 dBm output level. In one recent review of the machine, a famous New York mastering engineer praised the sound quality of the 3700, but wondered why, after so many complained about this same problem in the Model 3500, it was carried over in the 3700.

Figure 1.






A 3.3K resistor "piggybacked" to the 5.6K as shown changes the -18 dB digital level to -14 dB for the Panasonic SV-3700 DAT machine (inset).

The -18 dB standard makes A-B comparisons between this and other machines impossible, and playing back tapes recorded with high peak levels can result in distortion of other devices downstream in the audio path. My particular problem with the 3700 was too high a playback signal after setting the record pot for my desired average program level.

For those who prefer the -14 dB standard, I have a simple modification that involves two resistors added to the 5532 buffer amps that drive the balanced output stage. The schematic illustrated in Figure 1 shows IC 905 (and 906) with their feedback resistors R929 (and 930) of 5.6K.

Carefully solder a 3.3K resistor, preferably a one percent metal film, across the 5.6K's exposed leads on the top of the circuit board. This lowers the gain of the stage by 4 dB, allowing the record level to be turned up 4 dB, and that will result in -14 dB digital producing +4 dBu output.

Some technicians might not like the idea of "piggybacking" the 3.3K on top of the 5.6K. If this is done carefully, however, it will be reliable. An alternative would be to remove the whole board from the chassis, remove the 5.6K, parallel it across the new 3.3K, and reinsert and resolder the new combination.

By the way, the combination is the better way to go, since the composite resistance is 2.076K, a non-standard value.

*Editor's note: Field modifications to equipment may invalidate the manufacturer's warranty. Before attempting any repairs or modifications, consult the manufacturer for advice and guidance.*

*Always use the utmost care and follow good engineering practices when working with or around electrical equipment.* **RW** *will not assume responsibility for any loss or injury.*

*Richard Robinson is the chief engineer of Trod Nossel Productions & Recording, Wallingford, Conn. He can be reached at P.O. Box 57, Wallingford, CT 06492, or by phone: 203-265-0010.*

# *Clark Supports ADAT, DA-88*

**NORTHBROOK, Ill.** Clark Wire & Cable is now stocking components and prewired assemblies for the Alesis ADAT and Tascam DA-88 digital multitrack audio recorders. Both devices require multi-pin connectors to utilize the balanced +4 outputs. Clark Wire's custom cable assembly shop can pre-wire any or all studio wiring harnesses, including control/data cables as well as audio and video interfaces.

The company, which will be exhibiting at the Las Vegas NAB in booths 13262 and 13362, also has a new line of audio patch bays (both Bantam and quarter-inch), and interface panels which can be prewired to users' specifications.

For more information, contact Marc Dimmitt at Clark Wire & Cable: 1-800-222-5348, or circle **Reader Service 37.**

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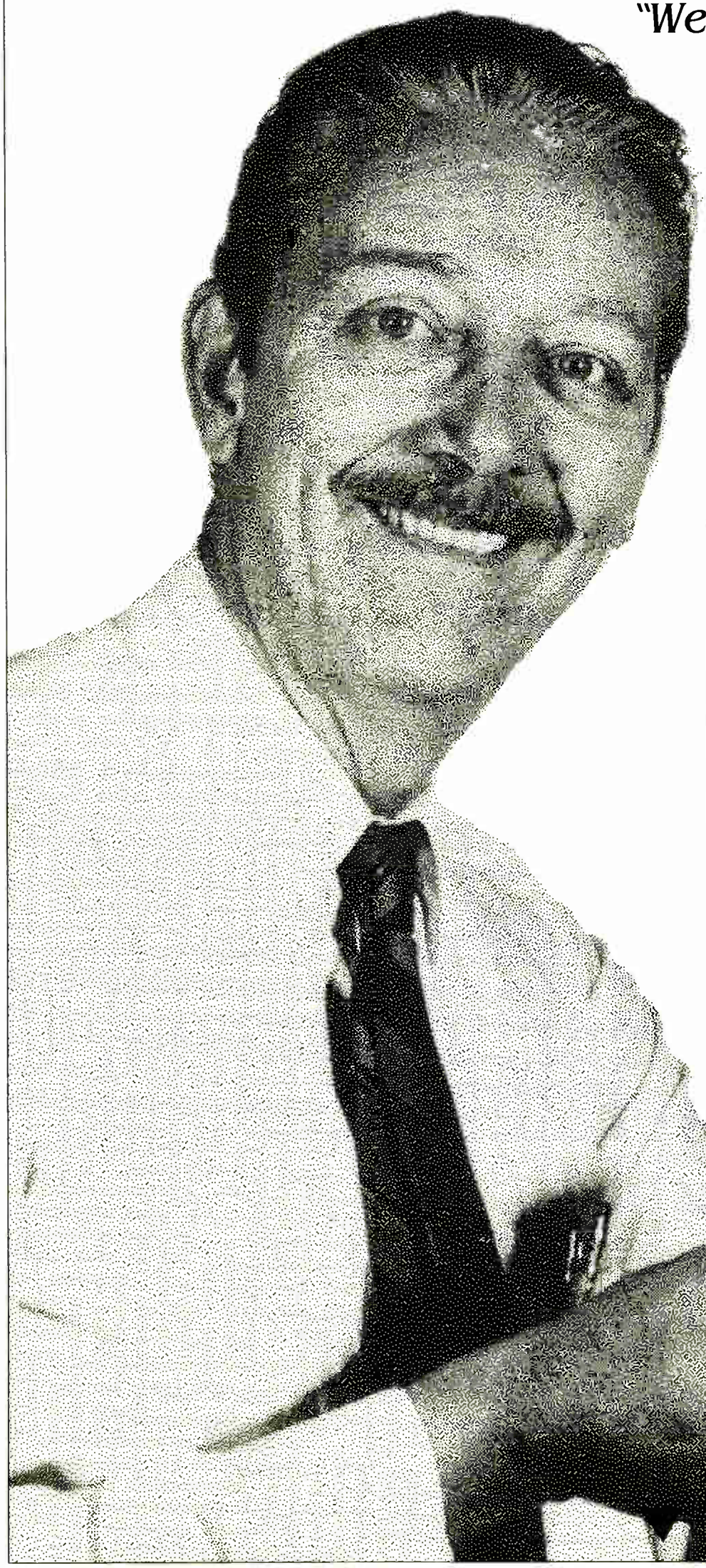

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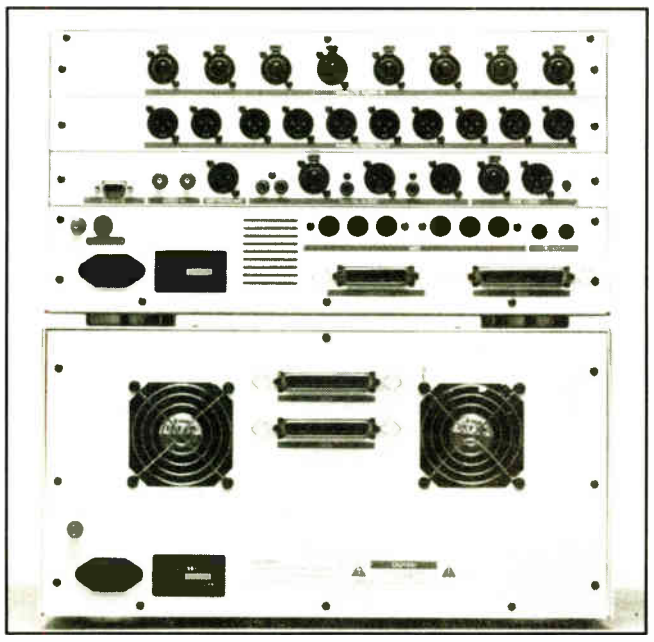
# Inside Korg's SoundLink

▶ continued from page 11

two of the eight tracks or a stereo master to the output. Digital Output Two keeps the same track and master assigns as set for Digital Output One, but allows you to switch between AES/EBU and SP/DIF. It also lets you change the copy status.

This arrangement allows you to output two different digital formats simultaneously. SoundLink is also equipped with emphasis/de-emphasis circuitry. In the "Auto" mode, the system reads the bitstream to determine the proper condition. You can also override the system to be either on or off.



The SoundLink's rear panel offers a variety of digital and analog I/Os.

As a bonus for MIDI users, the SoundLink has a pair of In/Out/Thru MIDI jacks, a built-in 16-track sequencer and a separate output for MIDI metronome.

Sync adjustments for digital audio and SMPTE video are also in abundance. Clock sources include Internal, Video reference, VITC, LTC and Digital Audio. SoundLink supports Internal, VITC, LTC and MIDI time code sources. Linear time code can be reshaped or regenerated. There are also adjustments for pre-roll, offsets, chase, VITC mode and line and varispeed.

Of course, the same features that make the SoundLink so valuable also make it more difficult to use than some other DAWs. Although the SoundLink offers the benefit of more dedicated controls than most computer-based workstations, it uses electronic "modes" and "pages" to reduce the number of dedicated controls. In each of the seven modes, there are a varying number of pages which you must navigate to make adjustments.

While the argument can be made that simple operation of the system is possible without going to all of the pages, the reality is that less experienced or more technophobic operators may require rescue. The motto "With Power Comes Responsibility" is particularly appropriate here. For the production director or production-oriented staff person, the SoundLink offers a lot of control.

Now let me hop over to the other side of the fence, and say that Korg's use of menus and pages is probably less dangerous than computer front-end systems that allow total access to the files. Put a file in the wrong folder by mistake or hit the wrong keystroke and you learn a new meaning for the word "oops."

The one major drawback of the earlier SoundLink has been addressed with software version 3.0c, which is now in the test mode. Prior to 3.0c, the SoundLink could not handle audio edits any smaller than one second. The notes accompanying version 3.0c acknowledge the improvement, but suggest that sections should still be longer than 10 milliseconds.

Check the next issue of **RW** for the second part of this two-part revue of the Korg SoundLink, when we'll take it out for a test drive.

□□□

*For more information on the Korg SoundLink, contact Rod Revilock in New York at 516-333-9100; fax: 516-333-9108; or circle* **Reader Service 101.**

*Ty Ford may be reached at his beta test site studio at 410-889-6201, via MCI Mail 347-6635 or America Online (Tford).*

# Acorn Called Impressive

▶ continued from page 6

combined into the transmission line to the KTWV antenna. The digital signal was combined into the KTWV signal at a level approximately 30 dB lower than the KTWV main carrier. Effective radiated power for the digital signal was only 54 watts.

Callaghan said the analog signal was like "a motorcyclist driving on a lane of the freeway." The motorcycle can weave from one side of the lane to the other and will occupy the entire lane. The digital signal, on the other hand, is like a bus full of people that drives down the lane of a freeway. It occupies the same lane of the freeway, but it has a great deal more capacity.

### On-channel explained

USA Digital spokespersons said techniques exist that permit the simultaneous transmission of in-band, on-channel FM digital audio signals which do not interfere with the normal analog FM signal. No modification to existing analog FM receivers is required.

FM receivers are very good at rejecting noise. According to developers, the receivers simply see the digital signal as noise 30 dB below the carrier level of the analog FM signal and reject it. A more difficult challenge is to recover the digital signal which is 30 dB below the analog signal in the same frequency spectrum.

USA Digital engineers said recovery of the digital signal has become possible through the use of an adaptive transversal filter based on acoustic charge transport (ACT) technology.

ACT is a solid state device through which a wave passes, much like a wave of water passing across a pond. As the wave passes from one end of the chip to the other, it is sampled along the way and analyzed. By the time it comes out the other end, enough is known about the wave to cancel it out (by more than 35 dB). This, according to USA Digital, is the method used to eliminate the analog FM signal so that the digital signal can be recovered.

**Subjective listening tests of the Project Acorn FM system clearly showed the advantages of the digital signal.**

Developers claim there are techniques to mitigate multipath problems, but they were not explained in detail at the Los Angeles demonstration.

Given the 30 dB difference in radiated power of the analog FM and the digital signal, the in-band, on-channel system is not likely to extend the coverage area beyond that now obtained by FM stations. FCC rules prevent that. However, if the system works as advertised, the in-band, on-channel approach should provide significant improvement in frequency response, noise, distortion, and signal availability within the present coverage area.

### The AM setup

The AM digital broadcasting set-up and demonstration also was informative. The 1660 kHz AM DAB test signal was

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# CCIR Decision On Global DAB Postponed

▶ continued from page 1

of the USA Digital consortium as "carrying the day" and helping to break the deadlock that developed between the groups.

USA Digital Radio, a partnership of CBS, Group W and Gannett, presented seven papers to the working group. It was "a tremendous amount of technical information," Springer said.

USA Digital also flew in its chief scientist, Bill Huntsinger of the University of Illinois, to explain the system, and invited working group delegates to a luncheon at which the Project Acorn in-band systems for AM and FM were demonstrated. Many of those in attendance had never witnessed a demonstration of the technology before.

The AM and FM demonstrations were identical to those conducted by USA Digital at the NAB Radio Show in New Orleans last fall, Springer said. (For more information, see the related articles in this issue.) He noted that the delegates from Japan and Sweden were "very interested" in the technology.

The interest from Japan was so great, Springer said, that the delegation actually broke the standoff on standardization. According to Springer, the Japanese supported the U.S. position, saying they were not ready to select a system until after U.S. testing has been completed.

The Electronic Industries Association (EIA) will be initiating tests of a variety of DAB systems, beginning this April.

The Japanese position led to a compromise by the working group. Springer said no world standard was selected, but the issue will be brought up again at another CCIR working group meeting in Geneva this October. He said that continued progress on in-band systems and system testing will be crucial before the October meeting.


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HARRIS ALLIED

Circle (143) On Reader Service Card

# AMAX Rare At CES Show

▶ continued from page 1

Marino said the committee continues to be optimistic, however, because of recent advances in chip design that allow noise blanking circuit costs to be reduced.

According to Motorola, engineering samples of the MC13022B and MC13027 chip set will be ready by mid-1993. Marino said a number of receiver manufacturers stopped in at the AMAX booth to get copies of the Motorola chip specifications.

Other encouraging signs of improved AM performance include the GE SuperRadio, a large portable, mono radio with narrow/wide bandwidth AM and external antenna connections for AM and FM. NAB AMAX Committee members are trying to convince GE to add noise blanking to the SuperRadio to meet AMAX specs, according to Marino.

**Few AM stereo radios**

At WCES, AM stereo products fared little better than AMAX. The WCES directory included an AM stereo radio category listing manufacturers and booth numbers, but a quick survey by **RW** revealed that most of the booths had no products.

# Major Effort for RDS

▶ continued from page 8

been the test site for RDS technology at last year's WCES, and he was confident he could set a new record in installation time.

With the help of KKLZ Chief Engineer (and RDS veteran) Warren Brown, Casey worked fast. He used the station's Optimod 8100 processor/generator as the composite sync source and then connected the RE533 to an auxiliary input on the station's Moseley STL. He checked the levels and verified the RDS signal, completing the installation within 10 minutes.

Not every installation would be so easy. Joe Sands, the contract engineer for KFBI-FM, KEYV-FM, KEDG-FM, KLUC-FM and KRRI-FM, informed Casey later in the day that STL inputs were unavailable for two of the five stations and could require installations at the tower sites on Potosi Mountain. But with a winter storm blowing in and the mountain already under 20 feet of snow, shuttling in by helicopter was quickly ruled out.

Casey relied on technology to bail them out. The RE533s shipped to KFBI and KEYV were capable of combining the composite signal with the 57 kHz RDS signal internally. After installing the units for RDS and composite output into the stations' STL at the studios, Casey was again on his way up Black Mountain to complete yet two more installations.

With no problems, KEDG-FM was outfitted with RDS, and Chief Engineer Tom Holmes met them at the KLUC-FM tower site on the mountain, where another uneventful installation was finished in just a few minutes.

In the early evening, Sands and Casey made the trek to Boulder City—about an hour's drive from Las Vegas—to connect an RE533 encoder to an available auxiliary channel on KRRI-FM's STL. As they were driving back to Las Vegas, Casey noticed the clock was not set correctly on an earlier installation. Reluctantly, they went back up Black Mountain to do some tweaking.

Shortly after 9:00 a.m. on the third day, KNPR-FM Chief Engineer Gale Gilbreath, who was involved in one of the first RDS demonstrations in 1986 for an NAB show, met Casey at the station's studios. Within a few minutes, Casey had completed the ninth installation.

By late afternoon, a long-awaited local marketing agreement between KOMP-FM and KYRK-FM was official, and Casey was given the go-ahead to install RDS at KYRK-FM. KYRK-FM Engineer Jim Liles, KOMP-FM engineers Mark Nolte and Robert Macdonald, and Casey packed into a pickup and headed up to Arden Peak, where KYRK had its transmitter.

Glad to be back down the mountain after making this last daring installation, Casey eagerly traded in his mountain boots for a WCES booth badge.

□□□

*Dee McVicker is a free-lance writer and regular contributor to* ***RW.***

# LA Engineer Impressed

▶ continued from page 18

transmitted from a spare 365-foot tower at the KNX transmitter site. Normal KNX transmitters were not used; instead, a digital exciter on 1660 kHz was fed into a 50-watt linear amplifier as an intermediate power amplifier. This intermediate amplifier was the driver for a one kilowatt linear amplifier operated at 200 watts. A class C amplifier could not be used.

It was interesting to tune across the signal. The signal was strong and appeared as a rise in the noise level 30 kHz wide. The signal was digital-only, with no analog amplitude modulation.

Audio was converted to a 96 kilobit data stream with error coding and interleaving added, bringing the data rate up to 126 kilobits.

Compact disc audio from the KNX STL was fed into the digital transmitter. This permitted instant A/B switching comparison between the analog KNX receiver output and digital receiver output. The digital signal arrived at the receiver output approximately 1.5 seconds later than the analog signal because of delays caused by the digital circuitry.

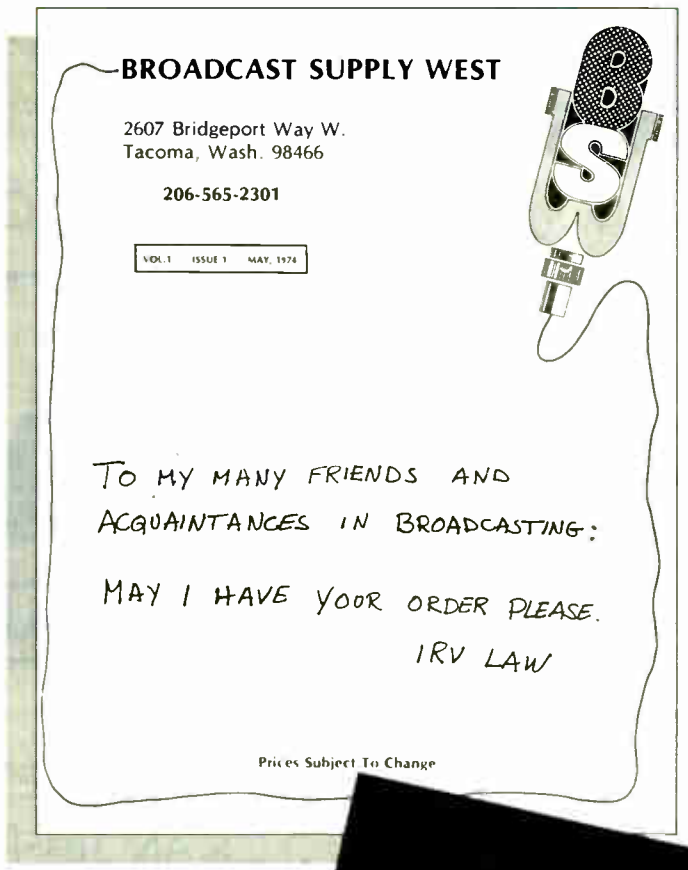
□□□

*Marv Collins is chief engineer at KFI(AM)-KOST(FM) in Los Angeles and an occasional contributor to* ***RW.***

*Equipment Solutions To Keep You Number One*

BSW

BROADCAST SUPPLY WORLDWIDE




**In 1974, the first BSW catalog changed the way broadcasters in the U.S. purchased audio equipment.**

# BSW: 20 Years at Radio's Forefront

## *New Logo and Name Reflect Industry Globalization*

**TACOMA, WA** On the eve of its 20th anniversary as the leader in the broadcast equipment business, BSW changed its name to Broadcast Supply Worldwide and redesigned its logo to mirror the new scope. The Tacoma-based firm, which began in 1973 as Broadcast Supply West, changed its name "to better serve today's worldwide industry," says President and General Manager Bernice McCullough. "We're really becoming the global village predicted years ago," she adds.

"BSW has always changed with the times to reflect the needs of our customers," says Tim Schwieger, marketing vice president . "Though the letters BSW stand for something new, our commitment to keeping our customers one step ahead with the most advanced products and finest service remains unchanged."

Since 1973, BSW has been supplying professional audio equipment to broadcasters, as well as to educational and government institutions. The company was started by Irv Law who saw a need to provide a new kind of service to broadcasters regardless of market size. Twenty years ago, broadcast equipment supply was dominated by a few original equipment manufacturers (OEMs) who favored big purchasers. Law's philosophy was simple, "all customers are created equal." In 1992, BSW added its first regional sales office located in the New York city metropolitan area. Staffed by Laura Tyson, this office offers customers on the East Coast an enhanced level of service and technical support. Today BSW, which services more than 4,000 clients annually, is making good on Law's promise to broadcasters in the United States and around the world.

BSW has always been an innovator. Before telemarketing had a name, the company was pioneering the technique. Even in the early days, customers could call BSW collect. As soon as nationwide toll-free, 800-telephone service was introduced, BSW seized the opportunity to better serve its customers. And when AT&T extended 800-service to Canada, BSW was again among the first to make it available. Now expanded AT&T WATTS service allows BSW customers to use the 800-number anywhere in the United States, Canada, Puerto Rico, the Virgin Islands, Alaska, and Hawaii. The phones are manned 12 hours daily, 6 a.m. to 6 p.m. Pacific time; 9 a.m. to 9 p.m. Eastern.

"New technologies are fueling a communications revolution in the broadcast and pro audio industries here and abroad," says Pat Medved, vice president sales, who oversees BSW's domestic and international sales. "At BSW its a matter of pride to keep up with the changes, work directly with every customer, and deliver the best value anywhere in the world."

"Satellites, fax, and Federal Express have changed this industry," says BSW founder Irv Law. "The international broadcaster looks to the United States as a model. He wants to be like the U.S. broadcaster, offering the same programming and using the same equipment. And at BSW we're committed to helping him achieve his dream."

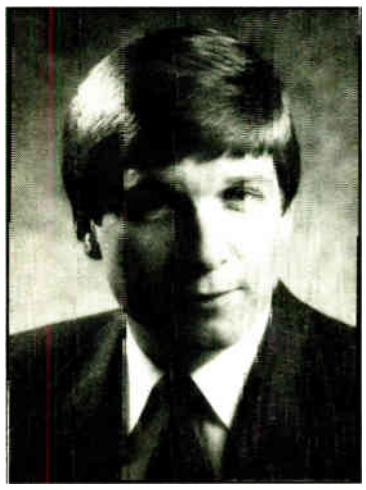
The primary way BSW communicates with its customers is through direct mail. An industry trailblazer in direct marketing, BSW reaches prospective customers with an annual catalog and supplements mailed every six weeks. For the first time this year, BSW's 120 page catalog will reach 60 countries. BSW's publications set industry standards for selection and information. Backing up this selection is more than a million dollars in inventory. In addition to maintaining a wide variety of products in stock from more than 200 suppliers, BSW offers its customers "In By 12, Out by 5 service." All orders for stock items placed by noon Pacific time are shipped by 5 p.m. Pacific time.

CELEBRATING TWENTY YEARS

**In 1993, the new BSW catalog is transforming the way world broadcasters do business.**

Special to Radio World

# BSW Management Profiles



Tim Schwieger, Vice President Marketing, is responsible for product development, advertising, marketing, and manufacturer relations with more than 200 companies. For more than a dozen years, Schwieger has played a key role in fostering BSW's growth. Under his leadership, BSW's sales have steadily increased and its roster of manufacturers has more than doubled. Schwieger, a veteran broadcaster, uses his experience to help customers solve problems and manufacturers develop more responsive products.

In 1981, when Schwieger joined BSW, he was one of two sales representatives. Within a year he was promoted to sales manager and supervising a sales department. A year later Schwieger was named vice president of sales and marketing and presiding over a flourishing company.

Schwieger's fascination with radio and its technology is lifelong. At 13 he talked his way on to the airwaves of a local university radio station, spinning platters on Saturday afternoons. In high school he attended the Bates Vocational Technical Institute, one of the West coast's premier radio/TV training facilities. Schwieger earned a first class radio telephone operator's license and for four years worked at KUEN in Wenatchee, Washington where he began as a disc jockey and later served as program director. After that, he worked in radio sales in Seattle. He then joined BSW.

Bernice McCullough, BSW President since 1988, has played a key role on the BSW management team for sixteen years. She is responsible for the operation and financial management of the multi million dollar broadcast equipment supply company. In addition, she's involved in advertising and sales. McCullough served as the company's Vice President and General Manger from 1979 to 1987.

One of the pioneer women executives in the industry, McCullough, brought to BSW a background in finance and administration. When she joined BSW's accounting department in 1976 she handled everything from bookkeeping and answering phones to taking orders. Previously, she had worked at the accounting firm of Ernst & Ernst for three years. Within a few months of joining BSW, McCullough was named General Manager and has been providing sound leadership ever since.

The entire BSW team

Patrick Medved, Vice President Sales oversees all domestic and international sales. In January 1992, the ten-year BSW veteran, set up a separate sales unit to meet the growing needs of international broadcasters, especially those in Central and South America and along the Pacific Rim. As a result, BSW's international sales have tripled in the past year.

Medved joined BSW in 1983 as one of three sales representatives. Within a year he was named sales manager and in 1987, he became vice president for sales, supervising a staff of seven.

Before joining BSW, Medved worked as a program and sales consultant with the Pacific Institute, a company specializing in motivational training for managers. He also worked in commercial and cable television production and engineering. He was graduated from the University of Denver with a B.A. in Mass Communication.



Special to Radio World

# Irv's Law: All Customers are Created Equal

It's 1973. You're 53 years old, the country is in a recession, and you've just lost your job. What do you do? If you're Irv Law, you start a brand new business using unproven sales techniques and call it Broadcast Supply West.

The first BSW office had three rooms, two telephones, and a staff that consisted of Law, his wife Betty, and his son Jeff. They sent out a mailer to 13 western states offering a few products and services and invited customers to call collect to place orders. And call they did.

Irv Law

Just before starting BSW, Law was Vice President of Sales for International Good Music (IGM). IGM was one of the early manufacturers of radio station automation systems and Irv spent a great deal of time on the road. "I remember a trip to Helena, Montana with the RCA rep," recalls Law. "On the way, we passed small town after small town. I asked the rep if he ever stopped in those towns. He told me he didn't. That was how it was back then; the reps called on the big city stations and the little guys had to fend for themselves."

When IGM founder Rogan Jones died, the company was sold and Law was out on the street. When he decided to start BSW, Irv focused on the smaller stations. Law says, "The little guys deserved the same service, selection, and low prices that the big guys got from RCA and Gates. I started BSW hoping the small stations would take advantage of the opportunity to order equipment they needed by phone.

"We began BSW without any franchises, but our western location was an advantage when we went to NAB to meet manufacturers and pick up new lines," says Law. "BSW was a wildcard, because before us most equipment was sold by regional offices with protected territories."

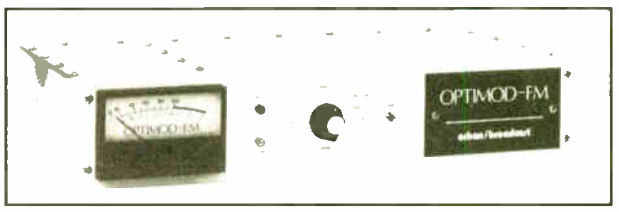
Almost overnight, BSW became national in scope. "Irv started to make a living on what he used to give away for free," notes Jim Wychor. Wychor was part owner and general manager of KWOA-AM and KWOA-FM in Worthington, Minnesota and has known Irv since his IGM days. According to Wychor, "Irv did a lot of freebies and consulting. In the process of selling an automation system, Irv would tell the station what else they needed and even helped them get it."

Tom Creighton was with Broadcast Electronics in the early seventies. "I remember trying to sell cart machines to Irv when he was at IGM. I couldn't get a word in edgewise, because 'Skinny Minnie' kept trying to sell me an automation system!"

Law was always a salesman. In the sixth grade, his paper route was so successful that he was able to buy himself a car. Since driver's licenses where not required in those days, Law used to drive himself to school at a time when most of the teachers could not afford cars.

His first independent venture was at age 14. He came across an aluminum pipe that could be used to siphon the cream off milk. Law figured he would strike it rich selling these pipes for 25¢ each. However, when he went out selling, he found that everyone he pitched already owned one.

Some of Law's other ventures also did not turn out as expected. He started a delivery service called Red and Blue. "Red and Blue delivers to you," recalls Law. "The only problem was that the fellows in the brown trucks, UPS, were starting at the same time and I couldn't compete." Other experiences included serving as manager of distribution for Best Foods and owning a marine supply business.




Irv Law cites the original Optimod-FM as the product that changed radio the most during the past 20 years.

Irv was sales manager of the Reinell Boat company when the company burnt down. The ad agency for Reinell also did business with KGMI in Bellingham, Washington. At KGMI, Rogan Jones was developing a radio station automation system and needed someone to sell it. Someone at the ad agency connected Law with KGMI, but Law was not interested. Jones kept pestering Law who finally gave in and took the job. It took three months for Law to make his first sale, but after that IGM automation took off. "I was a hero to GMs because I saved them money," Law recalls. "But I was the grim reaper to DJs and program directors."

In BSW's early years, Law did not have access to all the product lines he needed. He affiliated himself with another company in Atlanta in an arrangement that, to put it mildly, was a complete failure. The partner took money from 33 BSW customers and skipped town. To

continued on page 27 ▶



Special to Radio World

*Congratulations* **BSW**
*on your 20th Anniversary!*

Milestones are a time for assessment and reflection – a time to look forward as well as back. Accordingly, as you celebrate your 20th year, we know you are eyeing the road that lies ahead with the enthusiasm that has characterized your accomplishments in the past.

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Over the years BSW has become known as a high quality full service broadcast supply equipment supplier—but few know of the industry "firsts" that BSW has provided to the business.

## BSW
## HATS OFF TO YOU

**BSW:** First audio distributor to survive in Tacoma, WA

**IRV:** Successfully moved the president's office to his boat.

**PAT:** Single handedly coined the phrase "Two weeks."

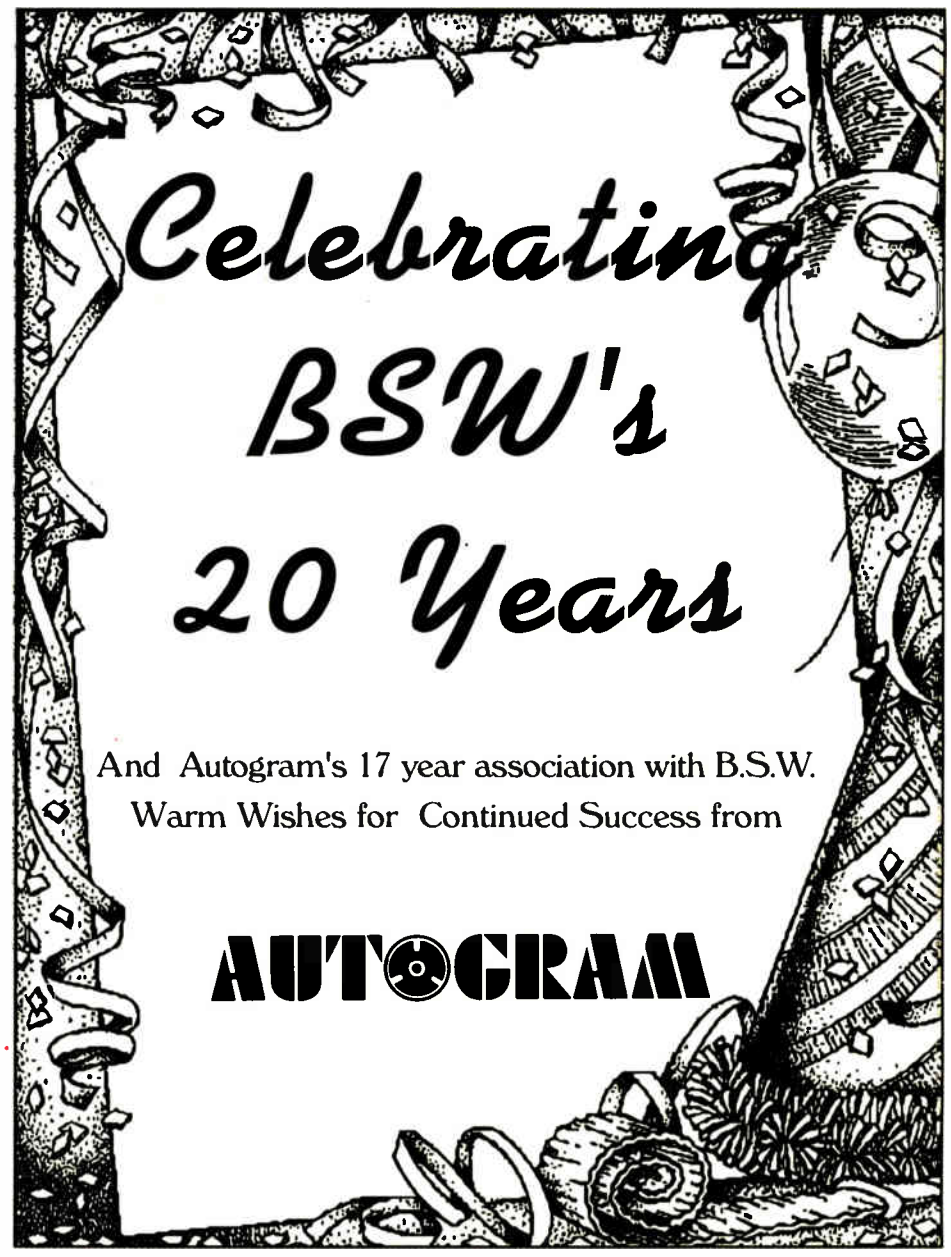
**KATHY:** If Kathy says there is 1198 45 RPM Record Jackets in stock, believe me, there *are* 1198. This is a first anywhere.

**BERNICE:** BSW's "First Lady" (Move over Hillary.)

**TIM:** Introduced the FAAP-2, Forced Air Audio Processor. (You know, that tube thing with a spring in it...)

Here's to another 20 years of good business and good firsts.

**Symetrix**




Special to Radio World

# Same Day Shipping: The Story in Pictures

At BSW your order is the top priority. The first supplier in the broadcast industry to guarantee same day shipping for in-stock items, BSW treats every caller like a V.I.P. Here are photos of some of the 28 people who stand behind that service guarantee and make BSW the fastest supplier in the business.

Joyce Eckroth, receptionist, answers your call and directs it to the sales representative who can best meet your needs.

Sales representatives Ed Longcrier (left) and David Scott (right) are two of the eight-member sales team devoted to serving BSW's domestic customers orders. Pictured: Ed counsels a customer on the best equipment for his specific application; David takes advantage of BSW's on-site warehouse to verify the availability of gear his customer needs right away.

Pat Medved, head of the international sales division, works on the logistics of providing an overseas order.

Patrice Rich verifies the accuracy of the order information.

Arlene Warden and Sheila Dalton are part of BSW's "can do" credit department. They assist customers with a variety of credit and financing options.

## BSW Firsts for the Broadcast Equipment Industry

- First to invite customers nationwide to call collect for product information and ordering.
- First to offer toll-free telephone service to the broadcast industry.
- First to extend toll-free service to Canada, Alaska, Hawaii, Puerto Rico, and the Virgin Islands.
- First to extend ordering hours to twelve hours a day, five days a week.
- First to offer a same day shipping guarantee.
- First distributor to maintain an inventory of over $1,000,000 of radio equipment.

Purchasing Manager Kathy Thatcher orders equipment not in current inventory.

Kerry Hills in the shipping department which is the last stop before your order goes out the door.

## REWARD!

BSW will pay $100 to the first five broadcasters who send us a copy of our first catalog!

To earn your reward, send your catalog to:
Tim Schwieger
Broadcast Supply West
7012 27th Street
Tacoma, WA 98466

Call BSW at 800-426-8434 for more information. Catalogs sent

# Irv's Law

▶ continued from page 24

Law, integrity is everything. While his lawyers advised him to declare bankruptcy, he was determined to make restitution.

Dale Tucker was one of those customers. At the time he worked at a station in Aspen, Colorado where "the owner was so cheap, part of my job was to account for every long distance phone call." Tucker received a BSW flyer with a invitation to call collect. He sent tape cartridges and a check to cover their reloading to the Atlanta address. He never got his carts back. But, "A little at a time," Tucker reports, "Irv made good on the money we lost. Every month we got a check. Some months it was only 37¢, but every month we got a check."

"These people put their trust in me," declares Law. "I did what I had to do to make things right." Ted Evans, former general manager and vice president of WWST-AM and WWST-FM in Wooster, Ohio says, "Irv put a lot of faith in the people he met and treated them well. His honesty was never doubted."

In the beginning, BSW was best known for its tape cartride reloading services and its private label ProCart. "Within weeks of opening BSW, we were known as a cart house," says Law. "We stopped offering cartridge reloading three years ago when the demand for the service dropped and the price of reloading was nearly that of a brand new cart. While carts are no longer our primary offering, we still move plenty of them."

Currently BSW offers the products of over 200 manufacturers and the company serves stations and networks of all sizes nationally and internationally. This pioneer in supplying radio equipment has remained one of the industy's largest distributors for over a decade.

One of the keys to this success was Law's willingness to do anything for his customers, an attitude that permeates BSW. "You have to have integrity and you have to be liked," Law instructs his sales staff. Jim Wychor recalls Law filling a most unusual request. "When new regulations were passed in 1985 helping the daytimers, we wanted to send a gift of thanks to the FCC commissioners and a few members of Congress. The idea was a clock with half a face and an inscription on the other side. I called my 'Uncle Irv,' and I don't know how or where he got the clocks, but he got them. There are only nine of these clocks in the world."

With the appointment of Bernice McCullough as president of BSW in 1988, Law's role in the day-to-day operation of BSW has diminished. "My work was my hobby," declares Law, who now spends more time on his boat. "The most important thing I did was delegating authority and getting out of the way. Hiring Bernice, Tim, and Pat is my claim to fame."

Ted Evans says, "Irv has the great ability to get the right people doing the right thing. He makes his staff and his customers into friends."




Special to Radio World

KEYBOARD CONNECTION

# Cybex Box Extends Your PC's Reach

**by Barry Mishkind**

**TUCSON, Ariz.** In the communications industry, communicating with the public is often easier than with someone in the next studio. Sure, there are intercoms of some type built into most consoles. But when the talent is live on the air, communicating important information to him can sometimes seem like a sideshow in action.

Usually, internal studio communication is a combination of hand signals, charades, scribbled notes, and/or IFB comments that can easily distract the person on the air. Some studios that were built on a very tight budget also feature what I call the *ITW intercom*: Just raise your voice, and the talent can hear you through the *Incredibly Thin Walls*.

## Say it by PC

Clearly, computers have been a real boon for many, especially talk show staffs who need to provide clear, quick information to the host. Programs exist to display who is holding on each line and what topic concerns them, current weather or traffic information, even news flashes that can be quickly and accurately passed along.

On the other hand, the host may want to communicate a message to the staff without doing it "on the air." Unfortunately, most talk show computer programs are not designed well for two-way communication.

Two computers are often linked with a null modem, so each can type to the other. However, this system has limits. If both sides try to type at the same time, gibberish may result, or overwriting and destruction of the information already on the screen may occur.

A different solution is provided by Cybex Corp.: PC-Companion and PC-Companion Plus. This relatively inexpensive set of two boxes and cables allows you to attach a second keyboard and monitor (and even a mouse, with the Plus system) to a single IBM-compatible computer, allowing two persons to access the computer at the same time.

Preventing two people from trying to type at the same time is accomplished with a "control and delay" feature. When a keyboard is used and becomes active, it seizes control and locks out the other one temporarily with a two second delay. As soon as typing ceases, the system is ready for the "other side." There's also a toggle switch to permanently lock out the remote.

With the ability to put up to 250 feet of wire between the host and remote keyboard and monitor, PC-Companion allows the linked computers to be located virtually anywhere it's convenient. One base computer can even service several studios, by using a "repeater" or by simply and quickly changing cables.

Another interesting product from Cybex is the PC-Extender. For stations that want to keep the actual computer out of the control room, either for noise control or security purposes, PC-Extender comes ready to plug in and go.

## Software update

If you're looking to purchase or upgrade your spreadsheet or database applications, don't miss these super deals on two super packages. To celebrate the February 1 release of the Windows version of its popular Paradox database program, Borland has reduced the price to $139 until April 30th. Quattro Pro for Windows, a solid competitor to Microsoft Excel is also priced right until the end of April at $99.

Both of these products take full advantage of the graphical environment of Windows to make databases and spreadsheeting easier than ever to learn and to use. Don't be fooled by the low prices, these are full, professional programs with nearly unlimited capabilities.

Neither should you fear the learning curve with either one. Lots of on-line help is available, as well as aftermarket books. For example, my eye was caught by the cover of "Paradox 4 Made Easy" (1992, Osborne McGraw-Hill) by Edward Jones. It offers to help "build your own working sales and inventory tracking system." Whether you want only to catalog inventory or develop a billing system for your contract engineering business, this book provides step-by-step instructions and examples.

I used this book myself and found that learning Paradox while developing a program to meet my personal needs was efficient and enjoyable. The whole series of "...Made Easy" books is designed for beginning and intermediate users to quickly become familiar with a program and its features.

On a more comprehensive level, The LeBlond Group's "Guide to Quattro Pro for Windows" (1993, Ziff-Davis Press) provides detailed instruction on getting the most out of Quattro Pro. Emphasizing business applications, the book not only teaches you how to manipulate data and build budgets and reports, it shows how to display the information in graphs and even develop it into a "slide show" for an impressive presentation to the boss. Would you like to show graphically how a new transmitter would cut running costs? Using this book will make your status as a genius secure.

One more book well worth your attention is Jerry Pournelle's "PC Communications Bible" (1992, Microsoft Press). This is designed to be read as advice from a friend. The book is filled with everything from simple instructions on how to install a modem to Pournelle's recommendations on hardware and software.

Next up: What are infobases? In our next installment, we'll explore infobases, show how they can make your job easier, and provide some interesting relaxation.

□□□

*For more information on the PC-Companion or PC-Companion Plus, contact Cybex Corp. at 205-534-0011, or circle* **Reader Service 69.**

*Barry Mishkind, aka* **RW***'s "Eclectic Engineer," can be reached at 602-296-3797, or on FidoNet at 1:300/11.3 or "barry@coyote.datalog.com" on Internet.*

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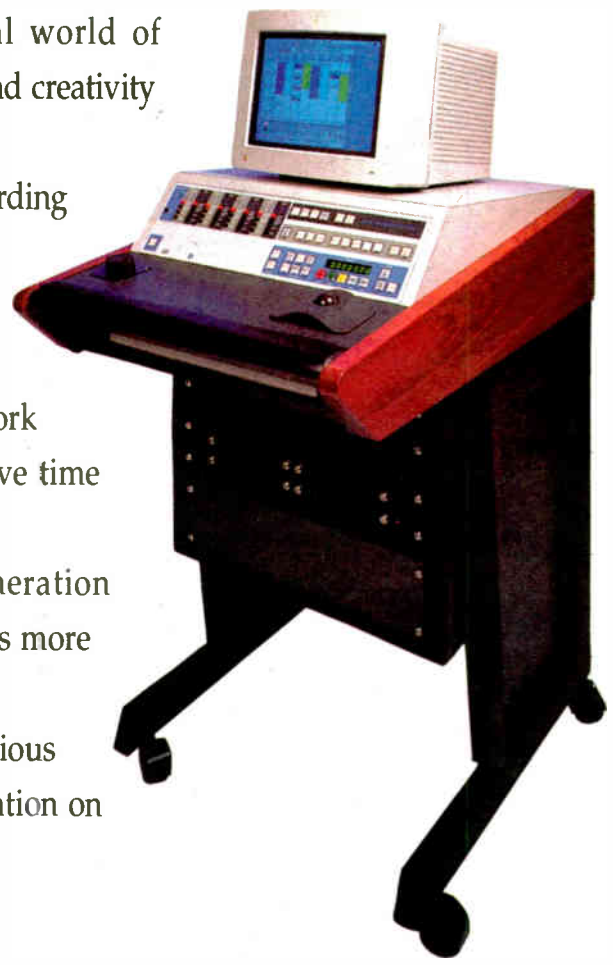
Just imagine having the ability to precisely replay complex multitrack production work the way you mixed and equalized it yesterday, last week or last month! Think of the creative time saved when a change or update is requested in an otherwise perfect mix.

Plus, the ADX is unencumbered by the architectural limitations of first-generation workstations and is designed to grow and expand with your needs. Even the basic system has more standard features than anything before.

And like all PR&E products, ADX is a powerful tool optimized for the fast and furious demands of broadcasting and backed by world-famous PR&E support. Call today for information on ADX, the next generation of digital.



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**DESIGNS THAT MAKE THE DIFFERENCE**

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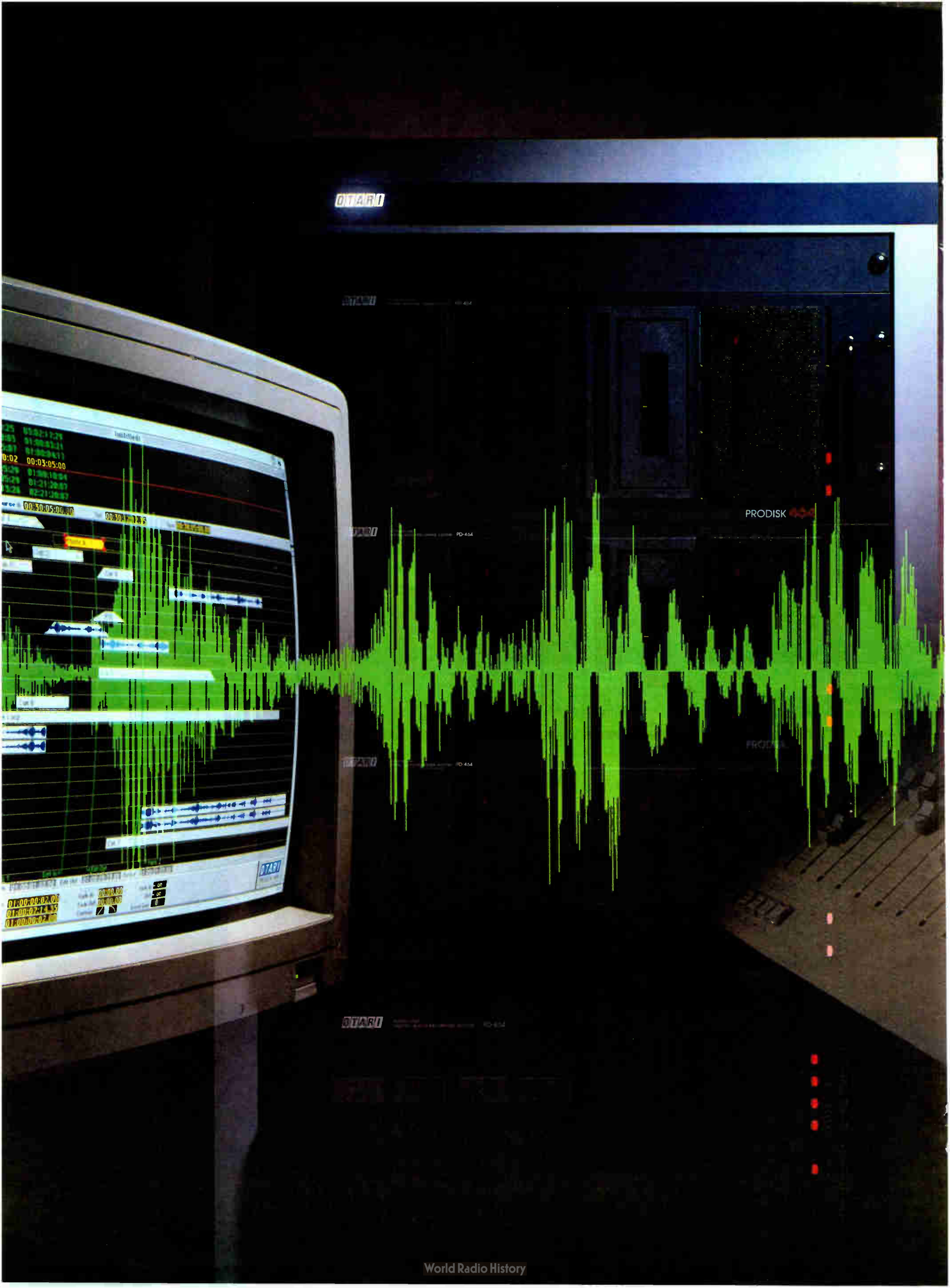
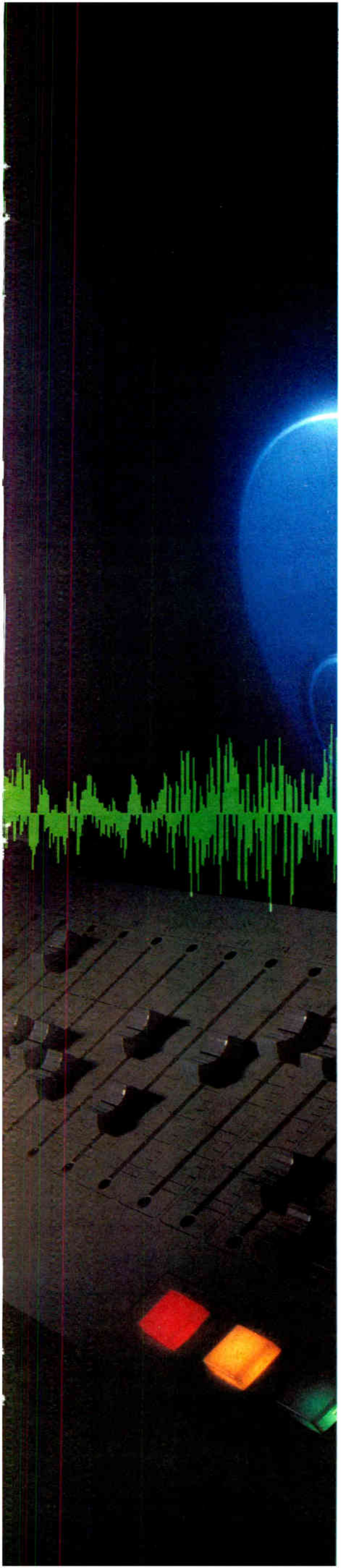
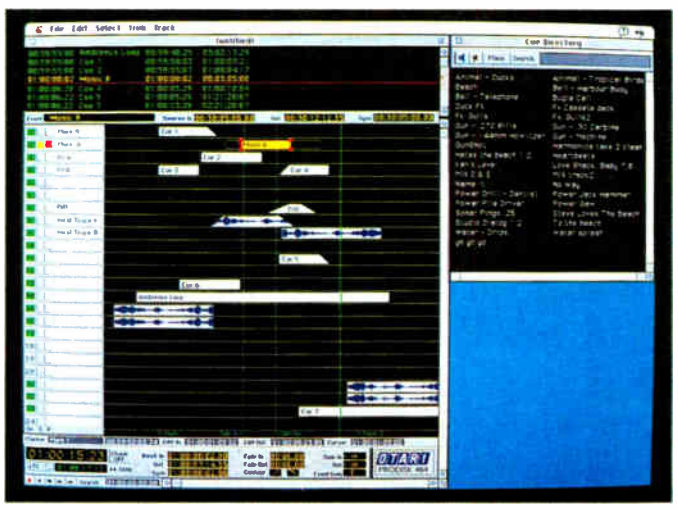




# There are a lot of multitrack digital audio workstations out there, but only one with Otari's name on it.

Right now, it seems like everyone is building audio disk recorders. The difference is, we'll still be building them three years from now.



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Sure, Otari's new ProDisk™ 464 is the only system to give you up to 64 tracks. True, it's one of the few to use standard SCSI devices so you won't be locked-in as technology advances. But as much as we'd like to tell you about the rest of its great features, the most important thing about the ProDisk system (given the changes that are certain to occur in this technology) is the Otari name up front—a name that professionals around the world have come to trust for product support and customer service.

Speaking of the future, you can be sure that ProDisk's open architecture allows for hardware, software, and storage media enhancements as they come along, and that it's plug-compatible with your current equipment. And if you're familiar with Otari's product philosophy, you know you're getting the best possible value on the market.

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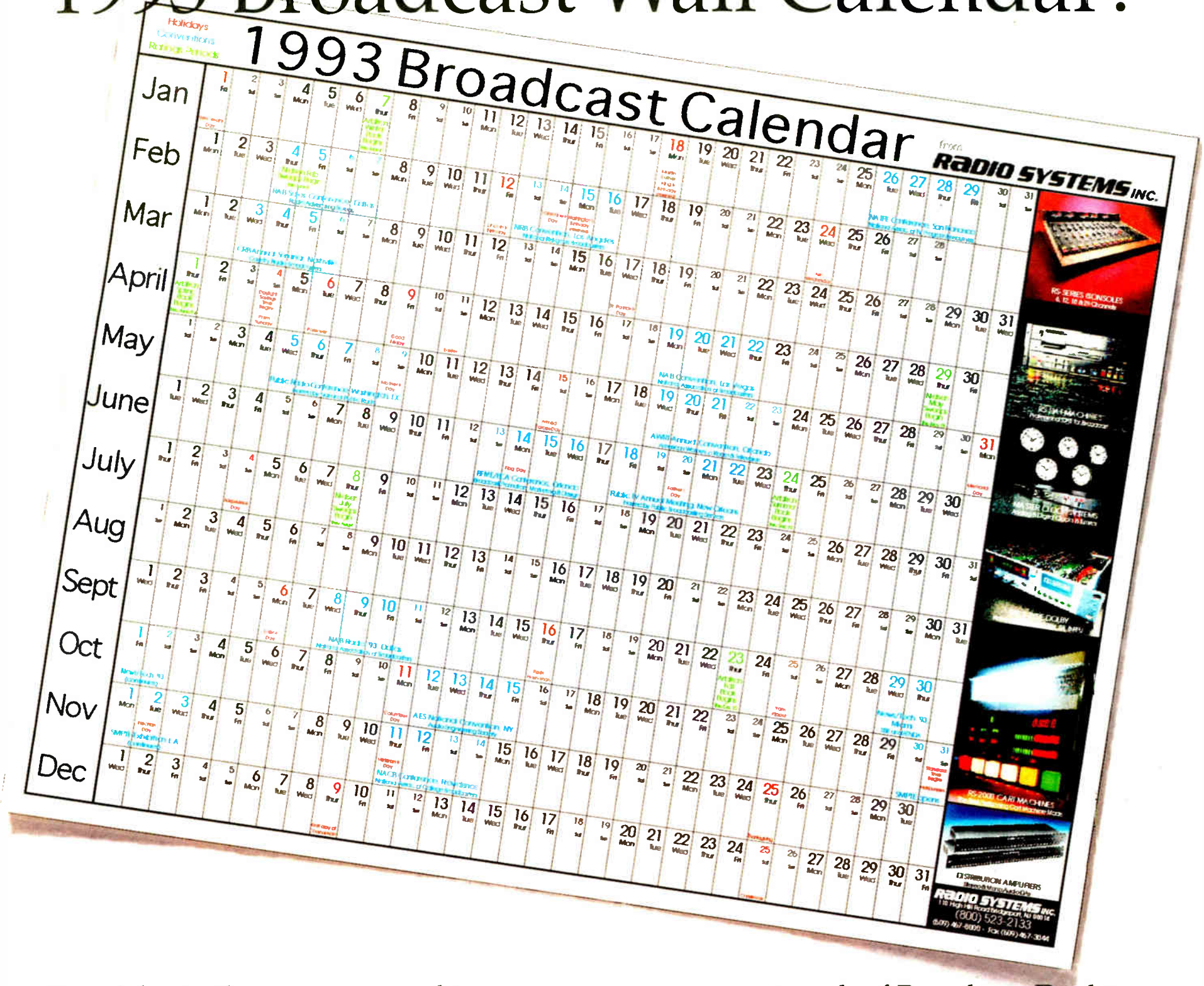


To celebrate the new year and to announce our new network of Broadcast Dealers, Radio Systems has produced the first wall-size broadcast calendar. In its year-at-a-glance format you'll find major broadcast conventions, radio and TV rating periods, and, of course, major holidays. It's free for the asking - just call!

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LOWPOWER LOWDOWN

# Translators Play a Role in RDS Transmission

**by Howard L. Enstrom**

**MOUNT DORA, Fla.** The course of broadcasting was dramatically affected by the introduction of FM, which itself has evolved since then. Many FM stations transmit with much higher effective radiated power (ERP), most use a circularly-polarized mode, and even more radiate directionally. Program distribution in stereo uses space-age technology. Strategically-located terrestrial translators fill in and extend coverage.

The listening public takes it all for granted, largely unaware of what can be done to provide additional services with an FM signal's subcarrier.

### Just doing their job

In the nearly 20 years that low power FM translators have been around, their roles have all been the same—they transmit a replica of the primary station signal. This transparency, or faithfulness in processing a signal, uses frequency multiplexing subcarrier modulation to transmit special and additional information and data.

A conventional full-service FM station and its translators can carry such additional information in coded analog, whereby the message pattern is mimicked by changing amplitude of electrical values. Or, coded digital, whereby the two numbers (binary) convey all information. Loudness of voice modulation is expressed by code patterns of 0s and 1s at specific points in time.

When an FM signal's subcarrier has imbedded sets of encoded commands, receivers with decoders recognize their command set and obediently perform according to all commands. If the point of reception also has transmit facilities, some may be used to reconfigure programming by switching to peripheral equipment, or alternate sources, for a different input signal.

A primary station could control and program its translators in various communities with pertinent material. A different approach is to use a computer-telephone modem to control and program a translator. The translator has a phone line interfaced with equipment to render telemetry to determine operating parameters, to schedule local announcements and to change or update them. Digitally synthesized voice audio is stored and retrieved on command.

As for rules that would allow today's type of translators to originate programming, don't hold your breath. I can see the possibility of community low power FM stations for the future, however. I think one can assume they would use part of the UHF spectrum.

### RDS and translators

A few have asked how RDS (Radio Data Service) might affect FM translators. Yeah, some say the system is the greatest technical advance in broadcasting since the advent of stereo.

Actually, RDS is for FM listener convenience and pleasure. It uses an inaudible FM subcarrier signal to feed digital information for reception by a compatible receiver. Receivers without a decoder are unaffected by the special signal.

The European Broadcasting Union sponsored development of RDS and recommended it as a European standard, eight years ago.

RDS is a double sideband suppressed carrier data signal with a center frequency of 57 kHz. The subcarrier signal emits 1187 bits per second, 730 data and 456 control/check words.

Perhaps a compelling reason for use of RDS is the desire a broadcasting network has to attract and hold listeners—particularly if they are moving in a vehicle through coverage areas of network stations. When the listener presses a button to state his preference for program format, RDS monitors all stations airing that format and places the receiver in a position to instantaneously switch tuning to the frequency channel of the most receivable station.

Obviously, a translator can rebroadcast the complete signal of an RDS headquarters or network station, but the imbedded command codes would not control it. But it's interesting to think about the potential of an FM signal to do more than provide a main and sub-channel aural signal for information and entertainment. A number of U.S. FM stations do so without listeners knowing, just as satellites and their transponders handle a good many non-video services not apparent to TV viewers.

While the inherent transparency of a translator allows the FM station to have the benefit of faithful extended coverage, there is also a potential to provide extra services.

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*Howard L. Enstrom is an engineering consultant and president of FM Technology Associates, Inc., specializing in engineering design and sale of FM translator services and equipment supply. He can reached at 904-383-3682; by fax at 904-383-4077; or by mail at 30925 Vista View, Mount Dora, FL 32757.*

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COLE'S LAW

# FCC Flexes Its Punitive Muscles

**by Harry Cole**

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First, on the hot topic of fines and forfeitures, unless you have been stuck in a sensory deprivation tank for a couple of months, you have no doubt heard that the FCC is upping the ante for "indecent" programming. In October, the Commish issued a whopping $105,000 (count 'em, one hundred and five thousand dollars) to a Los Angeles station for the broadcast of Howard Stern's show. Ouch.

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### Gray areas

Despite the fact that the Commission has adopted "guidelines" for its fines, those guidelines include a lot of leeway (or, to use a technical legal term, "fudge factors"). Having invoked that flexibility to crank the Stern fine up into six figures, the FCC may be hard-pressed (or unwilling) to ratchet things down to a more reasonable level.

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### Keep the studio staffed

Undisturbed, that is, until June, 1991, when an unsuspecting station found out the hard way that the FCC really expects each "main studio" to have at least one full-time management person and one full-time non-management person on hand.

Now, more than 15 months later, the Commission has further clarified that standard. Well, kind of. In response to a petition for reconsideration by the unfortunate licensee (as well as supporting comments from the NAB), the FCC has offered the following information.

First, we have a list of positions that satisfy the "meaningful management" presence at the main studio. They are president (or other corporate officer), general manager, station manager, program director, sales manager, news director, personnel manager, facilities manager, operations manager, production manager, promotion director, research director, comptroller or chief accountant. Also, a chief engineer will qualify as long as his or her job includes "managerial duties," *i.e.*, the authority to make "typical managerial decisions pertaining to facilities, equipment, programming, sales and emergency procedures."

This, of course, seems to invite a certain amount of title shuffling within the station's ranks. However, the Commission assures us (albeit in a footnote) that the FCC's "emphasis is on job duties, rather than job titles."

The Commission has acknowledged that such management personnel would not have to be "chained to their desks" during normal business hours. Instead, they can "conduct significant business outside the office" as long as they report to work at the main studio on a daily basis, spend a substantial amount of time there, and "use the studio as a home base," with responsibility for "whatever station operations occur from that studio."

Second, with respect to the non-management person at the studio, the Commission has said that, if that person has time to spare over and above his or her station functions, that person may work for another business to the extent that "coverage of the main studio permits," as long as the main studio is always attended during normal business hours.

All of this additional guidance is certainly useful, if still pretty vague. What is amazing is that apparently the FCC thought that we could glean all of these various nuances from the mere phrase "meaningful management and staff presence."

And our final update topic today involves the rulemaking designed to overhaul the EBS system. This was initiated in the summer of 1991, with a very general notice of inquiry. In October, 1992, it moved forward with the issuance of a notice of proposed rulemaking. The thrust of the proceeding continues to be the modernization of the EBS system.

### Devising a gadget

Unfortunately, the latest notice is still a little soft on detail. It appears that the centerpiece of the Commission's current thinking is a device (aptly referred to throughout the FCC's notice merely as "the Device") which would permit reliable EBS warnings to all radio and television service providers (including broadcasters and cable operators).

Among other proposed characteristics, the Device would: permit automatization; be compatible for all services; have self-testing capability; require multiple station monitoring (to reduce dependence on a single station); and allow itself to be programmed by individual stations to interrupt programming for certain types of emergencies in certain areas.

Of course, all of this sounds just great. The problem is that, while such a device is theoretically possible, no such device has yet been fully developed—at least as far as the Commission lets on. Indeed, the FCC is seeking further comment on any additional parameters (or bells and whistles) which might be designed into the Device. We are thus still a long way away from the ideal EBS system.

That may not be such a bad thing. According to the Commission, the expected cost of the new equipment is likely to be in the $50-60 million range for the broadcast and cable industries. Yikes. The FCC candidly acknowledges that it has no precise estimates of the value of property losses which might be saved if the new equipment were to be installed, although we are assured that the increased speed of the proposed EBS system "can be expected to yield a disproportionately large public interest gain." That may be true, but if the FCC is going to spend $50 million of somebody else's money, it might be nice to have the anticipated benefits tied down a little tighter than that.

A last thought on the EBS proposal. The Commission's eagerness to engage in the micro-designing of "the Device" and to require the acquisition and installation of that Device stands in stark contrast to the agency's well-known reluctance to embrace an AM stereo standard a decade ago. Perhaps the regulatory pendulum is swinging back.

If you have any questions about the EBS proposal, indecency, or main studio requirements, you should be sure to contact your communications counsel.

□□□

*Harry Cole is a partner in the Washington-based law firm of Bechtel & Cole, Chartered. He can be reached at 202-833-4190.*





staff, equalizers are among the most used and abused items in the studio. Employed properly, they can create a multitude of special effects for production, overcome intrinsic response limitations of transducers, and correct general response problems. Improperly used, they can create engineering and production nightmares.

State-of-the-art amplifiers have ruler-flat response across the audio spectrum; transducers do not. A transducer is a device which converts one form of energy to another. Since we live in an imperfect world, however, this transformation is not linear.

### Standards exist

Equalizers present an opposite response curve to that presented by the transducer in question, to produce a flat overall response. Industry-wide standards have been established to ensure compatibility from one machine to the next.

In analog tape technology, the record and play heads both require equalization. The head gap, load impedance of the head, and magnetic properties of the tape all combine to place limitations on frequency response. Equalizers are provided in the record and play electronics to correct for slight differences between heads.

Aligning a recorder for optimal frequency response begins with the playback electronics. Following a careful cleaning and demagnetizing of the tape path, play back an alignment tape and verify proper head azimuth.

Next, playback the tones and note levels on a DVM, after setting the 0 reference. If all is well, your tones should fall within 2 dB of the equalization curve provided in the manual. If not, don't rush to adjust the equalizers, not just yet.

Make sure your alignment tape is new. Repeated use (even on demagnetized machines) will partially erase the higher-frequency tones, giving false low readings for HF (magnetic field) response. If you're using a full-track alignment tape on a half- or quarter-track machine, the fringing effect will produce false high readings on tones below 700 Hz for 7.5 IPS, and 500 Hz for 3.75 IPS. In short, a new alignment tape that matches your machine's track configuration is necessary for response readings to be valid.

### Replacing the playback heads

Poor HF readings with the right alignment tape suggest a badly worn playback head which must be replaced. Playback equalizers can compensate for slight wear of the playback head, but when you can feel the groove with your fingernail, it's a lost cause. Trying to correct for this much wear with EQ will result in increased HF noise, amplifier overload and distortion, and oscillation in extreme cases.

If you've replaced an original head with a generic substitute, getting satisfactory EQ may be a problem. A good trick is to install a loading resistor across the head, effectively changing the match between head and amplifier. Head impedances average between 500 and 1200 ohms.

You may encounter a tape machine in the field that has had the equalizers so badly misadjusted that restoring proper EQ with an alignment tape is next to impossible. Next, the record EQ can be adjusted for flat overall response through the previously standardized playback system.

Whenever a turntable cartridge or preamp is installed or replaced, its response should be verified with a test record. Cartridge overhang and alignment, as well as stylus condition, needs to be verified before making a response run.

I recently installed new preamps with older Stanton 500 cartridges and experienced runaway HF response. Checking the preamp solved the problem, and brought the response to within one-quarter dB.

Long cables from the tone arm to the preamp should be avoided, as these can also effect HF response. Typically, the cable has a capacitance of 20 pF/foot, and this must be added to the loading capacitor to arrive at the correct component value. While these are not equalization problems per se, they are often misdiagnosed as such, and much time can be wasted experimenting with the RIAA/NAB filter combination. Remember that the distributed resistance, inductance and capacitance of a long metallic pair combine to roll off the high frequencies. Simple equalizers can be constructed with an inductor, capacitor, and rheostat to yield a flat response, while more elegant designs include an amplifier to compensate for line losses.

□□□

*Tom Vernon, a regular* **RW** *columnist, divides his time between contract engineering and completion of a Ph.D. He can be reached at 717-367-5595.*

# WORKBENCH

# *Hidden Perils of Production*

**by John Bisset**

**FALLS CHURCH, Va.** Even in this day of digital workstations, the razor blade still has its place in many production rooms. If it's your job to supply the production director with fresh blades, you may wonder where they all go. We recently found the answer: The Studers ate them!

Studer A-810 machines have a nice ledge at the bottom of the machine. Among other things, the ledge covers the electronics. It also houses the function switches for the transport. This ledge is hinged to permit easy access to the electronics for adjustment. The machine is certainly designed to make engineering maintenance easy. The problem, however, is the hinged cover. There is a gap between the cover edge and the body of the machine. This gap runs the width of the machine, and attracts editing blades like a magnet.

The cache fished out of just one machine is displayed in photo 1. Also pictured are the needlenose pliers and duct tape that are used to put an end to this problem. It *is* a problem, too. If the blade falls just the right way, it can short out PC boards below. A narrow strip (about $^3/_4$ inch) of duct tape can be stuck on the underside of the flip-up ledge or cover to block the entry of errant editing blades.

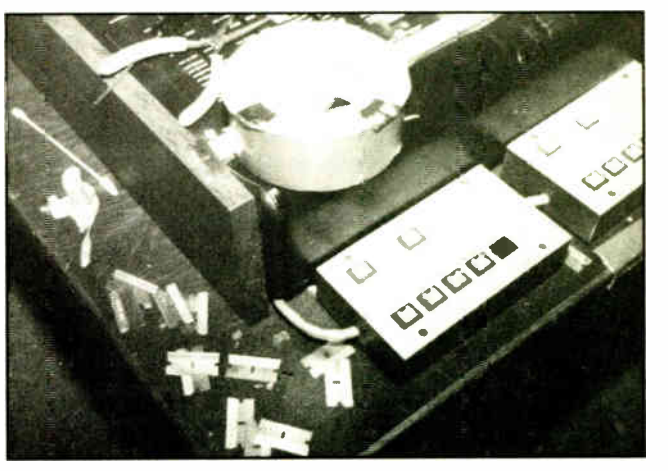

Photo 1: Proof positive that Studer A-810's have quite an appetite for editing blades.

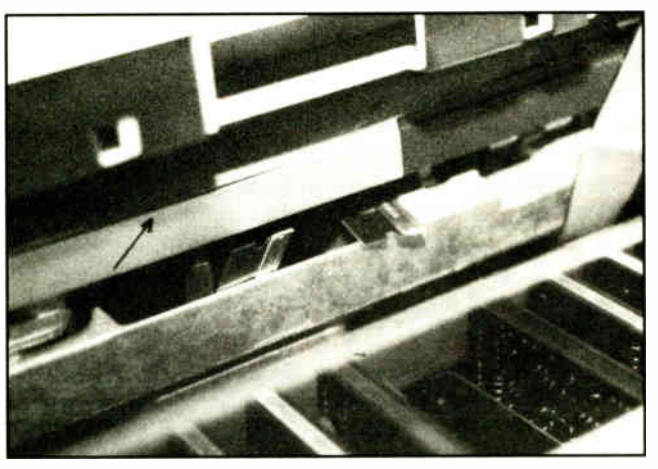

Photo 2: When the cover plate is lifted, blades can be seen. The arrow points to the slot which has been covered with a duct tape strip.

The needlenose pliers assist you in properly placing the tape over the gap between the transport body and the edge of the hinged lid. In photo 2, you can barely see some of the duct tape, as well as a couple of blades waiting to cause trouble. Sealing this gap is good preventive maintenance, and takes only a few minutes per machine.

★ ★ ★

It looks like Radio Systems wins the award for most useful calendar! If you haven't gotten your free copy, circle **Reader Service 183**. The year-at-a-glance calendar idea was conceived by President Dan Braverman, after seeing how useful such calendars were around the office.

Couple that usefulness with upcoming conventions and rating periods—and do it all in color—and you'll see why the Radio Systems calendar wins hands down. The folks at Radio Systems have done broadcasters a real service, at a price no one will dispute.

★ ★ ★

If you're suffering from telephone line problems, check the phone closet before calling the phone company. Loose wires, loose bridging clips, and broken cross connect wires that have been moved and repunched a lot can cause intermittent failures.

I'll add one other tip: If your studios share an office suite, be extra-wary of any phone guys in "your" closet. Capping your most important circuits with the little red caps pushed over the bridge clips can help, but it's not foolproof. It seems some of these technicians figure the red cap stands for "spare line," and are quick to yank your program or control circuits.

Speaking of yanking program circuits, one of our stations lost all their phones one day. Rushing back to the closet, I found a guy picking himself up after obviously falling off the stepladder. You guessed it: His natural instinct was to grab at anything—including the phone wiring—to break his fall. Thank goodness for STLs!

□ □ □

*John Bisset is a principal with Multiphase Consulting, a contract engineering and projects company. He can be reached at 703-379-1665.*

COLE'S LAW

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Undisturbed, that is, until June, 1991, when an unsuspecting station found out the hard way that the FCC really expects each "main studio" to have at least one full-time management person and one full-time non-management person on hand.

Now, more than 15 months later, the Commission has further clarified that standard. Well, kind of. In response to a petition for reconsideration by the unfortunate licensee (as well as supporting comments from the NAB), the FCC has offered the following information.

First, we have a list of positions that satisfy the "meaningful management" presence at the main studio. They are president (or other corporate officer), general manager, station manager, program director, sales manager, news director, personnel manager, facilities manager, operations manager, production manager, promotion director, research director, comptroller or chief accountant. Also, a chief engineer will qualify as long as his or her job includes "managerial duties," *i.e.*, the authority to make "typical managerial decisions pertaining to facilities, equipment, programming, sales and emergency procedures."

This, of course, seems to invite a certain amount of title shuffling within the station's ranks. However, the Commission assures us (albeit in a footnote) that the FCC's "emphasis is on job duties, rather than job titles."

The Commission has acknowledged that such management personnel would not have to be "chained to their desks" during normal business hours. Instead, they can "conduct significant business outside the office" as long as they report to work at the main studio on a daily basis, spend a substantial amount of time there, and "use the studio as a home base," with responsibility for "whatever station operations occur from that studio."

Second, with respect to the non-management person at the studio, the Commission has said that, if that person has time to spare over and above his or her station functions, that person may work for another business to the extent that "coverage of the main studio permits," as long as the main studio is always attended during normal business hours.

All of this additional guidance is certainly useful, if still pretty vague. What is amazing is that apparently the FCC thought that we could glean all of these various nuances from the mere phrase "meaningful management and staff presence."

And our final update topic today involves the rulemaking designed to overhaul the EBS system. This was initiated in the summer of 1991, with a very general notice of inquiry. In October, 1992, it moved forward with the issuance of a notice of proposed rulemaking. The thrust of the proceeding continues to be the modernization of the EBS system.

### Devising a gadget

Unfortunately, the latest notice is still a little soft on detail. It appears that the centerpiece of the Commission's current thinking is a device (aptly referred to throughout the FCC's notice merely as "the Device") which would permit reliable EBS warnings to all radio and television service providers (including broadcasters and cable operators).

Among other proposed characteristics, the Device would: permit automatization; be compatible for all services; have self-testing capability; require multiple station monitoring (to reduce dependence on a single station); and allow itself to be programmed by individual stations to interrupt programming for certain types of emergencies in certain areas.

Of course, all of this sounds just great. The problem is that, while such a device is theoretically possible, no such device has yet been fully developed—at least as far as the Commission lets on. Indeed, the FCC is seeking further comment on any additional parameters (or bells and whistles) which might be designed into the Device. We are thus still a long way away from the ideal EBS system.

That may not be such a bad thing. According to the Commission, the expected cost of the new equipment is likely to be in the $50-60 million range for the broadcast and cable industries. Yikes. The FCC candidly acknowledges that it has no precise estimates of the value of property losses which might be saved if the new equipment were to be installed, although we are assured that the increased speed of the proposed EBS system "can be expected to yield a disproportionately large public interest gain." That may be true, but if the FCC is going to spend $50 million of somebody else's money, it might be nice to have the anticipated benefits tied down a little tighter than that.

A last thought on the EBS proposal. The Commission's eagerness to engage in the micro-designing of "the Device" and to require the acquisition and installation of that Device stands in stark contrast to the agency's well-known reluctance to embrace an AM stereo standard a decade ago. Perhaps the regulatory pendulum is swinging back.

If you have any questions about the EBS proposal, indecency, or main studio requirements, you should be sure to contact your communications counsel.

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*Harry Cole is a partner in the Washington-based law firm of Bechtel & Cole, Chartered. He can be reached at 202-833-4190.*

# WORKBENCH

# Hidden Perils of Production

**by John Bisset**

**FALLS CHURCH, Va.** Even in this day of digital workstations, the razor blade still has its place in many production rooms. If it's your job to supply the production director with fresh blades, you may wonder where they all go. We recently found the answer: The Studers ate them!

Studer A-810 machines have a nice ledge at the bottom of the machine. Among other things, the ledge covers the electronics. It also houses the function switches for the transport. This ledge is hinged to permit easy access to the electronics for adjustment. The machine is certainly designed to make engineering maintenance easy. The problem, however, is the hinged cover. There is a gap between the cover edge and the body of the machine. This gap runs the width of the machine, and attracts editing blades like a magnet.

The cache fished out of just one machine is displayed in photo 1. Also pictured are the needlenose pliers and duct tape that are used to put an end to this problem. It *is* a problem, too. If the blade falls just the right way, it can short out PC boards below. A narrow strip (about $^3/_4$ inch) of duct tape can be stuck on the underside of the flip-up ledge or cover to block the entry of errant editing blades.

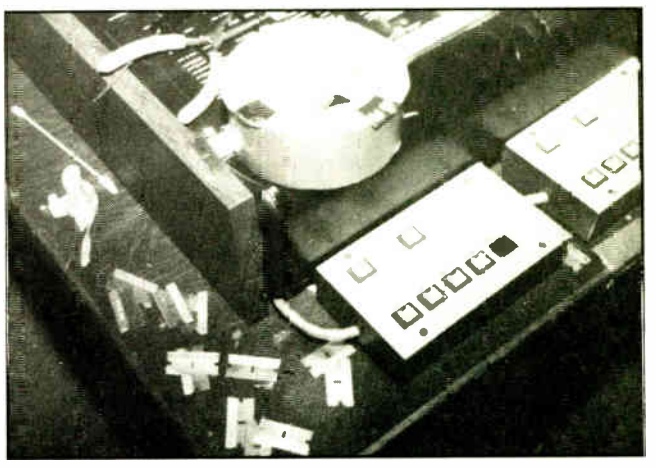

Photo 1: Proof positive that Studer A-810's have quite an appetite for editing blades.

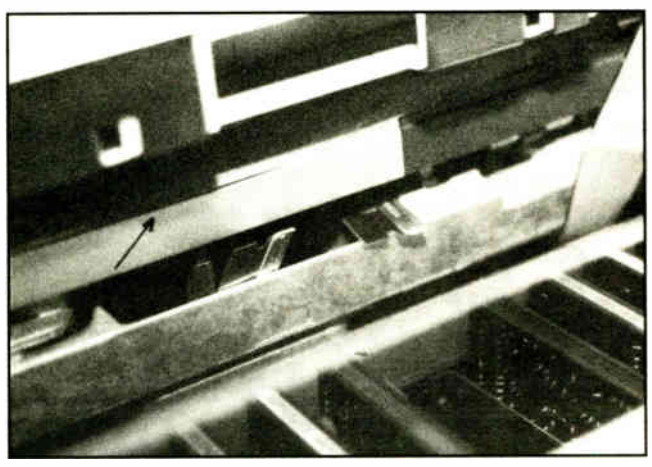

Photo 2: When the cover plate is lifted, blades can be seen. The arrow points to the slot which has been covered with a duct tape strip.

The needlenose pliers assist you in properly placing the tape over the gap between the transport body and the edge of the hinged lid. In photo 2, you can barely see some of the duct tape, as well as a couple of blades waiting to cause trouble. Sealing this gap is good preventive maintenance, and takes only a few minutes per machine.

★ ★ ★

It looks like Radio Systems wins the award for most useful calendar! If you haven't gotten your free copy, circle **Reader Service 183**. The year-at-a-glance calendar idea was conceived by President Dan Braverman, after seeing how useful such calendars were around the office.

Couple that usefulness with upcoming conventions and rating periods—and do it all in color—and you'll see why the Radio Systems calendar wins hands down. The folks at Radio Systems have done broadcasters a real service, at a price no one will dispute.

★ ★ ★

If you're suffering from telephone line problems, check the phone closet before calling the phone company. Loose wires, loose bridging clips, and broken cross connect wires that have been moved and repunched a lot can cause intermittent failures.

I'll add one other tip: If your studios share an office suite, be extra-wary of any phone guys in "your" closet. Capping your most important circuits with the little red caps pushed over the bridge clips can help, but it's not foolproof. It seems some of these technicians figure the red cap stands for "spare line," and are quick to yank your program or control circuits.

Speaking of yanking program circuits, one of our stations lost all their phones one day. Rushing back to the closet, I found a guy picking himself up after obviously falling off the stepladder. You guessed it: His natural instinct was to grab at anything—including the phone wiring—to break his fall. Thank goodness for STLs!

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*John Bisset is a principal with Multiphase Consulting, a contract engineering and projects company. He can be reached at 703-379-1665.*

STATION SKETCHES

# A Few Tricks to Getting Better EQ

**by Tom Vernon**

**HARRISBURG, Pa.** Of all the tools available to the engineer and production staff, equalizers are among the most used and abused items in the studio. Employed properly, they can create a multitude of special effects for production, overcome intrinsic response limitations of transducers, and correct general response problems. Improperly used, they can create engineering and production nightmares.

State-of-the-art amplifiers have ruler-flat response across the audio spectrum; transducers do not. A transducer is a device which converts one form of energy to another. Since we live in an imperfect world, however, this transformation is not linear.

### Standards exist

Equalizers present an opposite response curve to that presented by the transducer in question, to produce a flat overall response. Industry-wide standards have been established to ensure compatibility from one machine to the next.

In analog tape technology, the record and play heads both require equalization. The head gap, load impedance of the head, and magnetic properties of the tape all combine to place limitations on frequency response. Equalizers are provided in the record and play electronics to correct for slight differences between heads.

Aligning a recorder for optimal frequency response begins with the playback electronics. Following a careful cleaning and demagnetizing of the tape path, play back an alignment tape and verify proper head azimuth.

Next, playback the tones and note levels on a DVM, after setting the 0 reference. If all is well, your tones should fall within 2 dB of the equalization curve provided in the manual. If not, don't rush to adjust the equalizers, not just yet.

Make sure your alignment tape is new. Repeated use (even on demagnetized machines) will partially erase the higher-frequency tones, giving false low readings for HF (magnetic field) response. If you're using a full-track alignment tape on a half- or quarter-track machine, the fringing effect will produce false high readings on tones below 700 Hz for 7.5 IPS, and 500 Hz for 3.75 IPS. In short, a new alignment tape that matches your machine's track configuration is necessary for response readings to be valid.

### Replacing the playback heads

Poor HF readings with the right alignment tape suggest a badly worn playback head which must be replaced. Playback equalizers can compensate for slight wear of the playback head, but when you can feel the groove with your fingernail, it's a lost cause. Trying to correct for this much wear with EQ will result in increased HF noise, amplifier overload and distortion, and oscillation in extreme cases.

If you've replaced an original head with a generic substitute, getting satisfactory EQ may be a problem. A good trick is to install a loading resistor across the head, effectively changing the match between head and amplifier. Head impedances average between 500 and 1200 ohms.

You may encounter a tape machine in the field that has had the equalizers so badly misadjusted that restoring proper EQ with an alignment tape is next to impossible. The best solution then is to disconnect the playback head and substitute an audio oscillator, taking care to provide the proper match between generator and amplifier. Next, the record EQ can be adjusted for flat overall response through the previously standardized playback system.

Whenever a turntable cartridge or preamp is installed or replaced, its response should be verified with a test record. Cartridge overhang and alignment, as well as stylus condition, needs to be verified before making a response run.

I recently installed new preamps with older Stanton 500 cartridges and experienced runaway HF response. Checking the preamp schematic showed the loading capacitor as 47 picoFarad (47 pF). The data sheet for the 500s recommends 270 pF. Installing the correct loading cap in the preamp solved the problem, and brought the response to within one-quarter dB.

Long cables from the tone arm to the preamp should be avoided, as these can also effect HF response. Typically, the cable has a capacitance of 20 pF/foot, and this must be added to the loading capacitor to arrive at the correct component value. While these are not equalization problems per se, they are often misdiagnosed as such, and much time can be wasted experimenting with the RIAA/NAB filter components to correct what is really a cartridge loading problem.

Although microwave STLs have largely replaced phone lines to feed audio to the transmitter site, such lines are still used in smaller markets, and by college radio stations, which run their own pairs to carrier current transmitters or an FM site on campus. Equalization is necessary because the distributed resistance, inductance and capacitance of a long metallic pair combine to roll off the high frequencies. Simple equalizers can be constructed with an inductor, capacitor, and rheostat to yield a flat response, while more elegant designs include an amplifier to compensate for line losses.

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*Tom Vernon, a regular* **RW** *columnist, divides his time between contract engineering and completion of a Ph.D. He can be reached at 717-367-5595.*

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USER REPORT

# KLPW Goes Digital with the DAD 486X

**by George Meyer**
**Operations Manager**
**KLPW-AM-FM**

**WASHINGTON, Mo.** After years of automating KLPW-FM's country format with a crotchety, semi-reliable old carousel, we wanted to make the jump to digital. Besides its automation benefits, we wanted to take advantage of the editing capabilities available with a digital system.

We knew that most systems would give us a good sound, but we needed something that would give us the flexibility to run a live morning show, automated dayparts and sports broadcasts, as well as creating spots. That's when we met DAD.

### Suits our needs

The DAD 486X from **ENCO Systems** of St. Louis/Detroit seemed to have been custom-made for our needs. It has two distinctive modes of playing back the audio you need when you need it.

There is the ability to make playlists of liners, promos, stop sets, etc. for interfacing with our CD jukebox automation system to give us hours and hours of unattended walkaway time. We can make them as elaborate or as simple as we choose.

The other function of "DAD" (as Gene Novacek of ENCO refers to his creation) is the array screen that allows you to set up 48 audio elements, commercials, sound effects or anything else that is needed, right at your fingertips. It's like having 48 independent cart machines cued up and ready to go at the touch of a button.

### No buttons

I have forced myself to write the previous paragraphs because I've been dying to tell you about what I consider to be the best part of the DAD 486X: No buttons! None. Everything is done by touch screen, including digital editing.

Here is how a typical session of digital editing would work. First, you would record your voice track almost exactly as though you were recording onto a cart deck. Let's say you made a mistake during the recording process, but corrected yourself and then completed the copy.

When you have finished, you have two options. You can either hit the record button and do it again, or you can tell DAD to generate the audio graphically so you can edit it. I usually choose the latter method because it's more fun.

After DAD has brought up the EDIT screen, you'll see the typical "mountain range" of audio graphics with several ways to alter the cut. The first thing would be to trim up the head and tail so it has a tight, bright beginning and end.

Then, to remove any flubs, choose the "cut and paste" function. You're now ready to remove any mistakes. Edit points are determined and placed by touching the screen and dragging your finger to the desired locations.

DAD will let you audition any edits you are doing and also allow you to undo anything you don't like so you don't lose the original cut.

Other choices include "looping" audio or "pasting." Pasting involves taking a portion of the audio cut and inserting it somewhere else in the sequence. You have the choice of looking at the audio cut in different time scales.

### Audio graphics

You can make the screen show you the audio graphics in five-, 10- or 20-second portions. All durations of time are displayed on the bottom of the screen so you can keep track of how long the audio cut and edited segments are.

One other thing that can be done during the editing process is placing "tertiary" and "secondary" tones on the cut. In our application as an automation, non-music source, the secondary tone fires our CD automation system back to music.

The process I've described is for a single track of stereo audio. Both left and right channels are displayed during the editing process. There is an option to get DAD with two tracks so that you can record and edit voice and music tracks independently.

The screen is colorful and the "buttons" are ingeniously labeled so that selection of what to do is natural. There are only six screens to learn (one of which you see only during set-up), so that going from recording and editing to strolling through the library is a very quick task.

The screen even has the ability to be calibrated for your choice of touch sensitivity. The only time you'll need to touch the keyboard is to type labels for audio cuts. Even putting elements in the playlists is done by screen touch.

The manual for using DAD is only required to get you started and there are no pesky "help" keys that seem to raise more questions than they answer.

### Quality sound

The DAD 486X puts out CD quality stereo sound, and it performs equally

continued on page 40 ▶

USER REPORT

# PD-464 Makes Editing Job a Cinch

**by Steve Lushbaugh**
**Production Director**
**WMMR(FM)**

**PHILADELPHIA** On May 15, 1990 everything changed in the WMMR production department. That was the day we got our first **Otari** ProDisk-464 digital workstation.

After working as a radio production director for WMMS Cleveland, WBCN Boston, and for the past 13 years, at WMMR Philadelphia, I was used to making refinements in equipment.

I worked with Scullys, which were replaced by MTR-12s. And Eventide H910 Harmonizers are now fondly remembered as a preset on a H3000. But a digital workstation did things I couldn't even imagine in my dreams.

### Powerful and affordable

In response to an inquiry, I received some information on the PD-464. This thing looked like the ticket, so I made a call and a few days later I received the first demo of a PD-464 at the radio station.

I found it powerful, yet user friendly. It had more recording time than a full reel of tape, and the price was tens or hundreds of thousands of dollars less than comparable workstations.

You could buy a four-track system and later expand it to as many as 64 tracks. It was faster than a speeding bullet, and I knew I had to have it.

The PD-464 is a hard disk-based system. It consists of an "audio unit" containing the I/O converters and CPU hardware, and a "storage unit" housing the hard drives and an 8mm tape drive for backing up finished projects.

The PD-464 is controlled by a Macintosh computer. Any Mac will do a fine job, though I highly recommend using one with a large-screen, 16-inch or 19-inch monitor.

### Multitrack mode

Two modes of operation, "Multitrack" and "Cue List," make the PD-464 a versatile tool capable of performing in many recording environments.

I found the multitrack mode to be the most intuitive. To begin, just record enable some tracks, and hit the record button. But here is where the similarity to analog tape recorders ends. The Edit Pad window contains the true magic of the workstation.

Tracks can be edited individually without affecting adjacent tracks. Sound can be cut, copied, pasted, erased, crossfaded, slipped in time and so on, with just a few mouse moves. All editing functions are non-destructive so you can simply undo the last move if it wasn't what you wanted.

Whole projects of individual tracks can be duplicated instantly at the touch of a button. When used wisely these track and edit variations can provide you with literally hundreds of tracks within one project.

I find this invaluable when producing music with a lot of background vocals or "doughnut" spots with tons of inserts. Everything stays in time and in sync. No slaves. No fly-ins.

### Cueing mode

The Cue List mode handles sound in a somewhat more visual fashion. Each piece of audio is treated as an individual "cue." After it is recorded and edited to perfection it is placed in a vertically scrolling list.

Once there it can be moved in time by simply rolling its start time with the mouse. Multi-voice spots can be tightened up, dialogue overlapped, sentences inserted and so on in minutes. Cues can be stored in a Sound Library, and from there they can be re-edited and renamed with the original cue unaffected.

The Sound Library is sort of a "bridge" between the modes. Cues can be stored to and used from a Sound Library in either mode. Favorite sound effects can be stored indefinitely for quick retrieval.

All operations are blindingly fast. Most take less than a second. The system is loaded with time-saving features like 99 "auto locate" points, audible rewind and fast forward, natural sounding scrubbing, automated mixing and much more.

### More room

Recording time is 30 minutes per track, assuming that all tracks are recording all the time. Because they almost never are, you really can get a lot more projects on a PD-464 than you can on a fresh reel of tape.

Six months after we bought our first eight-track system, we added four more tracks and bought a second 12-track system. Now both of our production studios use them full time.

I must take time to tout the superb technical support we have received from Otari Digital Systems. I can always get someone on the phone who will take as much time as needed to answer a question or solve a problem. Problems, however, are rare these days. Continual software improvement has provided a rock-stable operating system.

Steve Lushbaugh stands next to his Otari PD-464 digital workstation.

I am really at a loss to do anything but praise this product. It is working great, and development of new enhancements and modes of operation is ongoing.

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*For information, contact John Carey in California at 415-341-5900; fax: 415-341-7200; or circle* **Reader Service 63.**

# *Work Performed By Touch Screen*

▶ continued from page 39

well in mono. You can easily choose between which cuts you want to record in stereo or mono and mix in both.

The system comes to you with the ability to store a minimum of over six hours of stereo (12-plus hours of mono) audio, and you can choose sampling rates of six and a half to 50 kHz. The DAD 486X can easily be networked to allow multiple units in production studios, newsrooms or AM/FM combos that need to share commercials or other audio cuts.

We had a few minor problems initially with our beta site DAD unit, but most have been cleaned up as ENCO has worked on refining its software package.

One great feature is that after a reset or power failure, DAD immediately returns to exactly where it was left in its playlist, so you're not scrambling to get it reconfigured after a "blink."

If you're looking for a digital audio distribution system that also provides versatile editing capability, I would recommend that you get your "DAD."

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*For information on the 486X, contact Gene Novacek in Missouri at 314-453-0060; fax: 314-453-0061; or circle* **Reader Service 139.**

USER REPORT

# 'SoundTools' Simplifies Audio Production Tasks

**by Paul Hufstader**
**Studio Engineer**
**Christian Science Monitor Radio**

**BOSTON** The Christian Science Monitor has been using **Digidesign's** "SoundTools" for over three years, and we've found it to be a fast, fairly reliable and inexpensive digital audio workstation (DAW).

It's easy to learn and easy to use, and at an initial cost of around $3,000 to $3,500 (not including hardware), it really is hard to beat if you stay within its simple editing parameters.

### A complete tool

We use three complete, standalone DAWs connected in a closed Ethernet network. Each system uses a Mac IIci with a 600 megabyte (600MB) hard drive.

This gives us about two hours of mono recording at a 44.1 kHz sampling frequency. We also operate under System 6.0.5 using multifinder, which allows us to run "Live List," a companion program we find essential for on-air use.

Yes, we broadcast directly from the Mac, so some of our stories never touch tape. We also have found the "QuicKeys" macro program and the "Timbuktu" remote access program quite valuable. Total cost per DAW is around $12,000.

We use our systems in three different ways: edit/assembly, broadcast and submixing.

### Digital editing

The first and most effective use is as an edit/assembly station. Many stories we air are simple A/B mixes or interviews that we need completed fast. No ambience, no sound-on-sound.

SoundTools was born for this type of mix. Numerical markers can be inserted while recording and easily recalled later as edit points. Unlike analog editing, in which you decide what to take out, digital editing lets you choose what to keep in.

In SoundTools, those segments are called regions. Once regions are established, assembling a story is as simple as clicking and dragging regions within a playlist. Want to smooth a transition? Cross-fade types and durations are adjustable from the playlist.

One section a bit loud? Volume also can be controlled from the playlist. We can alter start times and length of existing regions from the playlist. All of which makes for a fast yet thorough mix.

Once a piece is assembled, we enter the playlist into a "Live List" program, which can stack events from multiple soundfiles. This is critical for our broadcasts. Stories can be triggered by assigning a keystroke as the start event.

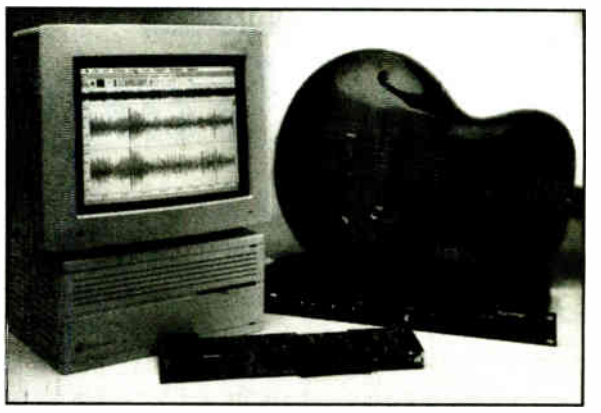
The stories do not have to appear in order; just hit the correct start event and the story airs. Unfortunately, some advanced cross-fades seem not to transfer from the playlist. So the transition that sounded so good during assembly suddenly becomes an abrupt butt splice when played back from "Live List." Although there is a way around it, we find it time consuming. So we dub to analog instead.

### A source machine

SoundTools does not allow you to lay in ambient sound easily and is not designed to control independent elements. But because assembly time is so quick, we do sub-mixes on the DAW and use it as a source machine in more complex analog mixes.

I should mention that we do not run the latest version of "SoundTools." In version 2.3, when using the scrub editor to locate an edit point and scrubbing out of the view window, we found that SoundTools has a habit of relocating itself somewhere else in the soundfile.

We use version 2.0.2, where everything seems to work fine. It would appear that the changes made in subsequent revisions have been mostly cosmetic and we were able to use "QuicKeys" as a remedy well before any revision came out.



Digidesign's "Soundtools" can be used for edit/assembly, broadcast and submixing.

Overall, SoundTools is a useful and important part of our audio production scheme. Despite some limitations, I still think it's the fastest thing on the block!

*For information on SoundTools, contact Brent Hurtig in California at 415-688-0600; fax: 415-327-0777; or circle* **Reader Service 125.**

INDUSTRY ROUNDUP

# Data Transfer Key to Digital Systems

## Removable Media Allows Workstations of Today To Be Faster, Easier to Operate, More Advanced

**by Mary Ann Dorsie**

**WASHINGTON** The easy transfer of information between systems is the future of digital audio workstations (DAWs), according to manufacturers.

What used to be a time-consuming process of transferring material is now made easier with removable media, said John Carey, VP of sales and marketing for Otari Corp.

"We developed the ProDisk 464 because its main memory disks can be removed and slipped in another system," Carey said. "For multiple users, it's a pretty successful solution."

### Sharing information

Copying material to tape or electronically transferring it is slow, he said. But removable media allows data to be shared or moved quickly between systems. Jobs can be segmented or done in multiple rooms, then brought together at the end, Carey said.

Rod Revilock, manager of professional audio for Korg, agreed with Carey.

"We're trying to work toward removable media," Revilock said. "It's a logical extension. It's slowly coming due to advances in technology."

Sonic Solutions also sees the need for networking systems together. Mary Sauer, senior VP of marketing for Sonic Solutions, said such networking is "a key thing that has been lacking in digital workstations."

**"Potential customers are becoming more aware of how real a product is. They're not so easily fooled by artificial promises."**

It's also important for people to expand their hardware and software options to meet their individual needs, she said. The basic hardware of Sonic Solutions' SonicStation is two or four tracks, which can be expanded easily up to 24 tracks, she said.

Another trend is toward lower cost modular systems, Sauer said. A couple years ago, DAWs cost up to $100,000 per system, with little or no room for expansion. This excluded people who couldn't afford systems in this price range, she said.

Gerry Kearby, VP of sales and marketing for Studer, also said the move to lower prices is the future of digital workstations.

"The trend is for higher performance at a lower cost, and that can be seen in the number of channels of audio we're now seeing on many workstations," Kearby said.

Combining digital signal processing and mixing consoles, so digital mixing and editing can be done on one unit, is another trend, Kearby said.

Gene Novacek, Enco's president, said he believes the next few years will bring a standardization of formats when moving from workstation to workstation.

"Now, we don't use formats in the same way," Novacek said. "It's important for one machine to talk to another." In time, he added, the industry will demand this standardization.

### Faster and easier

Novacek also said the users' demands always call for making things easier or faster. People are looking for graphic interfaces which are easy to use, he said.

The big thing now is to have a "pleasant, non-computer looking interface," he said. This includes Enco's DAD 486X, a workstation in which a touch-screen display acts as the keyboard.

While Korg's Revilock said the big trend right now is the lack of any real trend, he has seen a proliferation of two- and four-track systems based on computers.

Revilock also said he has seen an acceptance of the DAWs in the industry over the past year. "Previously, it was still new territory," Revilock said. "At this point, it's pretty well accepted. It's here to stay."

Otari's Carey said users are no longer being fooled by the deceptive advertising of products.

"Potential customers are becoming more aware of how real a product is," Carey said. "They're not so easily fooled by artificial promises. All companies are challenged by those facts," he said.

And if there's something that you'd like to see in a digital workstation that currently isn't there, just wait, said Enco's Novacek.

"With the drop in pricing of computer technology and the increase of power of computer technology, if you don't like something, wait six months," he said. "Everything we're doing now is obsolete in six months in terms of power."

# YOU DON'T KNOW WHAT YOU'RE MISSING




If you don't have an Eventide® VR240 Digital Broadcast Logger, you're missing the easiest, most efficient way to keep track of everything that goes out on your air, and more. There's no bulky, high maintenance, hard-to-use hardware, because Eventide has compressed a complete 8-to-24 channel digital broadcast logging system into one easy-to-use three-rack-space device. There's no need for a tape warehouse, either–the VR240 records up to ten days worth of audio on a single ultra-compact DAT cassette. With the dual-drive option, total unattended logging time stretches up to three weeks. And yes, you can search and play a tape on one deck while simultaneously recording audio on the other.

Without an easy, practical, multi-channel logging system, you're missing what's going on with your crosstown competitors, what your talent (and call-ins) *really* said on the air, when that commercial *actually* ran, who called your contest lines, what the police and fire dispatchers said. The VR240 even records modem, fax, and transmitter remote control telemetry transmissions. The advantages of logging have always been clear. Now the Eventide Digital Broadcast Logger gets rid of the disadvantages.

There's no broadcast logging system as advanced as the VR240. And with hundreds of Eventide-built digital loggers already in service worldwide, there's no other digital logger with our track record of reliable service. So don't miss out—call Eventide or your broadcast distributor for full information on the logger that makes full-time logging practical: The Eventide VR240 Digital Broadcast Logger.

**Eventide**

One Alsan Way • Little Ferry, New Jersey 07643 USA
Tel: 201-641-1200 • Fax: 201-641-1640

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# Products & Services Showcase

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READER SERVICE NO. 112

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If you've been wanting a hard disk recording system but thought you couldn't afford one, we've taken away your last excuse. Introducing — hard disk recording and editing on your AT-compatible.

**CardD™** $795
The CardD is an AT-compatible bus board that gives you:
- Real time direct-to-disk stereo recording and playback
- True professional-quality 16-bit audio
- Stereo analog inputs and outputs
- 32kHz, 44.1 kHz, and 48 kHz sampling rates

**EdDitor™** $250
The EdDitor is an interactive stereo waveform editing program that features:
- Non-destructive editing
- Cut, copy & paste
- Mix, face, crossfade
- Full zoom-in & zoom-out
- Catalog feature for fast access of sounds
- On-line help

AUDIO BROADCAST GROUP
2342 S. Division Avenue
Grand Rapids, Michigan 49507
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200 Fareway Drive - Suite 2
Smithfield, North Carolina 27577
**1-800-369-7623**

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STUDIO TECHNOLOGY

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## PORTABLE OFF SITE EBS MONITOR $350.00
Tuneable AM/FM Receiver and
FCC Certified Decoder Model C.D.

Ideal for use during hours of unattended operation at the studio and transmitter site. With modern remote control equipment the alert message can be put on the air with a telephone.
Decoder in a minibox (price $250.00) is available for use with receiver of your choice, or the decoder can be driven by phone line audio.

**Gorman Redlich Mfg. Co.**
**257 W. Union St.**
**Athens, Ohio 45701**
**FAX 614-592-3898 Phone 614-593-3150**

READER SERVICE NO. 10

# Shively

A good FM antenna is crucial to quality broadcasting. An antenna that is merely adequate will compromise the performance of even the best studio equipment and transmitter.

Shively regularly includes standard features that other companies either provide only as options or simply do not offer.

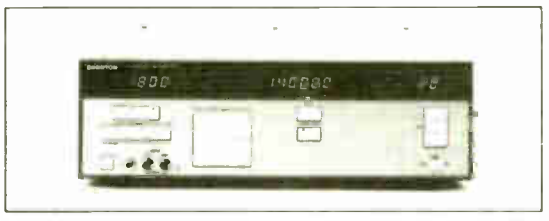
At Shively, we design and build antennas of uncompromising technical quality and performance. And, we build them to last.

*call or write for more information*

## Shively Labs
A Division of Howell Laboratories, Inc.
19 Harrison Road, Bridgton, ME 04009
207-647-3327 FAX 207-647-8273

READER SERVICE NO. 155

## $1000 REWARD *



The Model 1130 is a fully automatic distortion analyzer that replaces older, manually tuned instruments. The 1130 quickly nulls the fundamental and displays the distortion, typically in less than 1 second. The 1130 also measures AC and DC level, frequency, and SINAD with these standard features:

- Input levels to 300 volts
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- 500 kHz bandwidth
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- IEEE-488 Interface

* Trade in your HP330 series distortion analyzer for $1000 credit toward 1130. Similar offer applies toward 1120 or 1121 analyzers. Offer valid in USA only and expires 3/31/93.

All Boonton instruments include
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READER SERVICE NO. 14

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# TECHNOLOGY UPDATES

**STUDER**

### Dyaxis Lite: a Dialog and Music Editing System

**NASHVILLE** Combining the power of computer-based digital editing with the ease of use found in conventional tape machines, **Studer** engineers created Dyaxis Lite.

Dyaxis Lite is a compact, low-cost digital editing tool for basic, non-destructive, two-track dialogue and music editing, designed to be operated with no learning curve. A key component of the system is the Dyaxis Lite Remote Controller. This convenient, intuitive interface responds

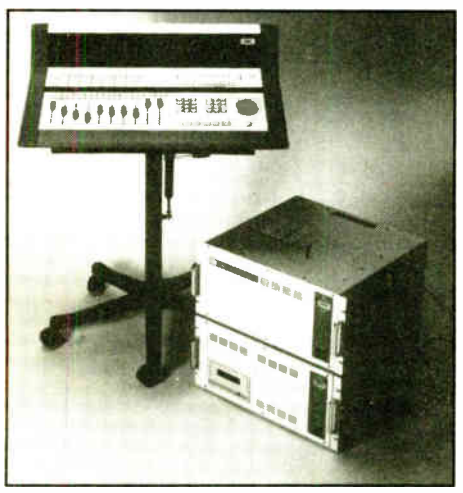
to commands and controls familiar to all audio professionals.

The Dyaxis Lite package includes a Mac Classic computer, Dyaxis Remote Controller, large internal disk drive and Dyaxis audio processor.

For more sophisticated post production tasks and recording applications, Studer also offers the Dyaxis I and Dyaxis II digital audio workstations.

Dyaxis II features real-time multichannel capabilities, real-time cross-fades in all editing and recording modes (including non-destructive punch in/out) and real-time digital mixing and signal processing in a modular multitrack package (expandable in eight-track, four-channel increments for up to 48 tracks of simultaneous playback).

*For information on the Dyaxis Lite, contact Thomas Jenny in California at 818-780-4234; fax: 818-780-4797; or circle* **Reader Service 108.**



**KORG**

### SoundLink Offers 8 Modes

**WESTBURY, N.Y.** The SoundLink by **Korg** offers many features while eliminating the need for a computer interface or third party hardware—all at a price range under $40,000.

The workstation offers eight inputs for loading several tracks of audio at once. SoundLink's internal digital mixer allows control of individual channel pan, three-band sweepable EQ, sends with internal reverb, noise gates and level. In addition, there's a full function compressor/limiter on the stereo output.

The dedicated console controls all functions for recording, editing, mixing, 16-track MIDI sequencing and video transport lockup (through serial communications). The recorder section is laid out similar to an analog multitrack with transport control (digital record and playback), input or output monitoring, meter bridge and record enable buttons.

The seven operating modes of the SoundLink include Misc Mode, Disk Mode, Audio Mode, Mixer Mode, Effect Mode, MIDI Mode and Mark Mode.

*For information on the SoundLink, contact Rod Revilock in New York at 516-333-9100; fax: 516-333-9108; or circle* **Reader Service 120.**

**MICRO TECHNOLOGY UNLIMITED**

### MicroSound DAW Plays 38 Stereo Tracks at Once

**RALEIGH, N.C.** Due to the recession and frequent ownership changes, radio stations throughout the nation find themselves in an awkward position. Old analog production equipment has been nursed well beyond expected lifetimes, while replacement budgets remain limited.

Recognizing this trend, **Micro Technology Unlimited** created the MicroSound Digital Audio Workstation (starting at $7,895), replacing many conventional components in one affordable package.

MicroSound is a mouse-driven, user-friendly DAW that plays 38 simultaneous stereo tracks mixed through two outputs. Overdubbing and real-time, non-destructive, graphic waveform editing are standard.

Multiple sounds can be kept on line in common files to quickly locate audition promos, music libraries or special effects. Automated or live assist playback is also available. MicroSound interfaces with all analog and digital (AES/EBU-SPDIF) devices and is network compatible.

*For information, contact Michael Stierhoff in North Carolina at 919-870-0344; fax: 919-870-7163; or circle* **Reader Service 19.**

INNOVATIVE QUALITY SOFTWARE

## Production Editing Made Easier with SAW's Speed, Precision and Graphics

**LAS VEGAS** The Software Audio Workshop (SAW) by **Innovative Quality Software** performs digital audio editing, mixing, sampling and other functions with ease, speed and precision. It allows users to craft sound visually through enhanced graphics, creating new perspectives on engineering and production.

Production editing is a snap with SAW. Cleaning voice-over tracks is as simple as marking Regions of vocals and chaining them together in Play Sequence. Regions can be adjusted easily and the Sequence can be altered endlessly, giving you amazing freedom in creating the perfect production.

Vocals can be blended easily with music beds using SAW's unique Live Preview feature, allowing you to hear and control the mix before actually processing the data to the hard drive.

Sound effects can be added to production work from already catalogued libraries.

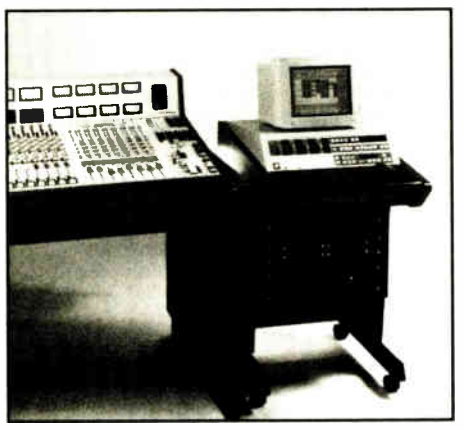
Regions or Sequence sections also can be MIDI triggered from any MIDI source or locked to SMPTE using a separate inexpensive MIDI/SMPTE card.

*For information on the SAW system, contact Bob Lentini in Nevada at 702-733-7854; fax: 702-731-3178; or circle* **Reader Service 57.**

PACIFIC RECORDERS

## ADX System Highlights Moving-Fader Console

**CARLSBAD, Calif.** **Pacific Recorders'** new ADX system is an eight-track digital audio workstation incorporating a moving-fader console automation system.



Specifically designed for the fast and furious demands of radio production, the ADX puts the power and flexibility of digital audio editing right where it's needed, in the production console. The ADX is easy to learn.

The ADX WorkStation operates much like the familiar analog eight-track recorder, but adds powerful editing capabilities; the MixStation provides console automation functions.

The ADX WorkStation can be purchased without the MixStation and will function quite well on its own.

*For information on the ADX system, contact Richard Maddox in California at 619-438-3911; fax: 619-438-9277; or circle* **Reader Service 77.**

360 SYSTEMS

## The DigiCart Alternative For Editing Voice-Overs

**TARZANA, Calif.** The DigiCart by **360 Systems** offers many practical, non-destructive editing capabilities within the framework of a stereo record/play device.

It's an inexpensive, easy-to-use alternative for editing voice-overs, effects and music beds when multitrack workstation capabilities aren't required.

In operation, head and tail markers, fades and output gain settings are stored as part of each audio file. These and other edit parameters can be recalled and modified at any time.

Additionally, individual files can be "cut and pasted" into lists for consecutive or sequential playback with DigiCart. This technique works especially well for compiling news actualities, commercial breaks, music beds or effects drop-ins.

Large volumes of material may be stored on hard disk, allowing instant access to thousands of cuts for playback or further editing. In this way, DigiCart differs significantly from larger PC-based workstations.

DigiCart also uses removable disks for data transfer, back-up and archiving. In addition to linear sampling rates, Dolby AC-2 data compression is included, producing a 5.33:1 increase in storage capacity, and a 10:1 data transfer rate with no generation loss.

*For information on the DigiCart, contact Don Bird in California at 818-342-3127; fax: 818-342-4372; or circle* **Reader Service 43.**

SPRAGUE MAGNETICS INC.

## Pro-SS Offers CD Quality

**VAN NUYS, Calif.** **Sprague Magnetics, Inc.**'s "Pro SS" offers a new line of professional-quality digital audio editing personal computer systems. Using American technology and software, these systems are able to deliver near-CD quality sound editing and mastering.

The quality of these systems is attributable to the power and high-speed processing capabilities of the latest Intel 486 microprocessors (although the systems will soon include 586 microprocessors). Turtle Beach of Pennsylvania, one of Sprague's primary software partners, also has provided its expertise in professional-quality stereo digital audio editing to the Pro SS series.

Sprague Magnetics owns the rights to the Ampex professional audio recorder line and has serviced the professional audio and film industry for over 12 years.

*For information, contact Bob Reiss in California at 818-994-6602; fax: 818-994-2153; or circle* **Reader Service 111.**



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Copy & Mail to: Radio World, PO Box 1214, Falls Church, VA 22041

AKG

## DSE 7000 Designed to Meet Needs of Radio Production With Minimal Difficulty

**SAN LEANDRO, Calif.** The AKG DSE 7000 is a fast, easy-to-learn 8-track editing and mixing system, designed specifically for radio production. Transport and console controls work like conventional studio equipment.

Editing is a simple matter of "rocking reels"—turning a scrubwheel that sounds exactly like hand-winding analog tape—and then pressing a few buttons. Because audio is stored in RAM and on disk, edits are instantaneous and cannot be undone.


In 1992, AKG issued two major software updates, with 30 new operating features including smooth tape-like varispeed and automatic mixer memory.

AKG's policy is to send these software updates free of charge to every registered U.S. owner.

*For information on the DSE 7000, contact David Roudebush in California at 510-351-3500; fax: 510-351-0500; or circle* **Reader Service 179.**

STUDIO TECHNOLOGIES

## StudioComm Series: Additions for DAWs

**SKOKIE, Ill.** The StudioComm Series by **Studio Technologies** consists of a number of products that add on to digital audio workstations and provide communications and monitoring functions. The StudioComm Series is designed to be used in conjunction with smaller consoles that do not have their own built-in communications section.

The StudioComm Series currently consists of three products: the Model 50 Central Controller, the Model 35 Talent Amplifier and the Model 51 Control Console. More products are in the works.

*For information, contact Barbara Govednik at 708-676-9177; fax: 708-982-0747; or circle* **Reader Service 52.**

ROLAND

## DM-80-L Resolver

**LOS ANGELES** **Roland**'s new "DM-80-L RESOLVER" was designed for applications in which users need to lock the Roland DM-80 hard disk recorder/editor to a SMPTE time code source for which the clock is different than the DM-80's, or to a "varying" source of time code, such as a poor analog tape deck that continues to run off speed.

This external device, one rack unit high, will allow the end user to lock the DM-80 sample clock directly to the frame edge of incoming SMPTE time code. In this way, a user can force the DM-80 to use the actual SMPTE time code as its sampling clock.

The external DM-80-L Resolver allows the DM-80 system to accurately frame-edge lock to any source of non-synchronous or vari-speeded time code and provide accurate synchronization over any amount of time.

This method of synchronizing digital audio workstations does not introduce any distoration into the digital audio signal. Retail price of the DM-80-L is $995, with availability in the first quarter of 1993.

*For information, contact Roland Pro Audio/Video in California at 213-685-5141; fax: 213-726-8865; or circle* **Reader Service 136.**

SOLID STATE LOGIC

## Scenaria's Single System

**NEW YORK** The Scenaria from **Solid State Logic** is a complete digital soundtrack production system that allows access to all of the devices needed to complete a large-scale soundtrack via a single control surface.

Scenaria incorporates a 38-channel digital audio mixing console, 24-track digital audio recorder, multitrack audio editor, multiple machine controller, automated routing system and random access video in a single product.

Full compatibility with SSL's ScreenSound digital audio editor and SoundNet digital audio network enables large-scale multi-user editing and dubbing projects to be handled by a single system.

Integral to Scenaria is SSL's first digital audio mixing console dedicated to post-production applications. The 38-channel mixer provides dynamic automation of all parameters—including EQ and dynamics—and provides familiar hardware controls in a compact, assignable control surface.

Each channel is provided with four-band parametric sends. Unlike other systems, signal processing is available on all channels at all times. Automation data is stored both by audio clip and to time-code, and is automatically updated when edits are performed.

*For information, contact Piers Plaskitt in New York at 212-315-1111; fax: 212-315-0251; or circle* **Reader Service 174.**

AKAI

## Optical Disk Recording And Editing Exists With DD1000i

**FORTH WORTH, Texas** The **Akai** Digital DD1000i is a magneto-optical disk recording and editing system, capable of recording one stereo track at a time, and playing back two stereo tracks in synchronization.

The unit provides a pair of stereo balanced analog and digital inputs, and two pairs of stereo balanced analog and digital outputs. Sampling rates of 48 kHz, 44.1 kHz, 44.056 kHz and 32 kHz are supported.

Each side of the magneto-optical disk stores approximately a half hour of stereo audio at 44.1 kHz. The built-in display allows full, non-destructive waveform editing, and the creation of cue lists and play sheets.

The DD1000i also can be controlled with a remote locator, the DL1000, or from Macintosh software. Pro net price is $14,995.

*For information on the DD1000i, contact Mike McRoberts in Texas at 817-336-5114; fax: 817-870-1271; or circle* **Reader Service 145.**

# MARKETPLACE

**Radio World's** Marketplace, a compendium of new and recently introduced radio broadcast products, appears monthly in Buyers Guide

### Portable Four-Channel Recorder

**Nagra-Kudelski** has introduced the NAGRA-D, a portable, battery-powered, four-channel digital tape machine for location recording.

The machine offers high performance field recording—offering 58 minutes of uninterrupted four-channel, or one hour and 56 minutes of two-channel operation on standard five-inch reel of quarter-inch digital tape, recording 4x24 bits.

The NAGRA-D offers consistent operation regardless of environment, and offers two-hour maximum operation per battery.

Employing a quarter-inch open reel tape format, the machine's track width minimizes signal degradation from tracking errors. The format also provides easy access to the tape transport for head cleaning and maintenance, as well as tape editing in the field.

For information, contact Danny Grimes or Bob Gelernter in Oklahoma City at 405-521-9000; fax: 405-524-4254; or circle **Reader Service 94.**

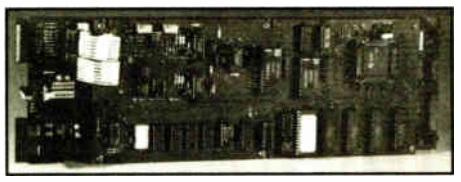
### Radome-Protected 950 MHz Antennas

**Ham-Pro Antennas** has introduced radome-protected 950 MHz STL antennas, with 25 percent larger reflectors than other grid cylindrical parabolics for higher gain. The antennas meet both Category A and B specifications for the 800 to 975 MHz bands

The same reflector is used for the Ham-Pro 450 MHz STL antenna, and for other frequencies from 300 MHz to 975 MHz. They may be used for low power UHF TV broadcasting and point-to-point communications.

The antennas may be mounted either vertically or horizontally for the desired polarization. They may be shipped in knock-down form for either UPS or air freight to reduce shipping costs. The antennas weigh less than 60 pounds.

For information, contact Peter Onnigian in California at 800-879-7569; fax: 916-381-4332; or circle **Reader Service 12.**

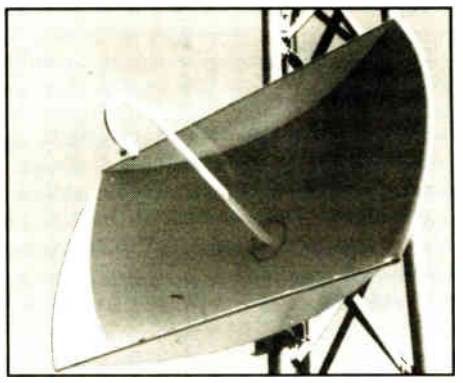


### 1834 Digital Audio Demodulator

**Wegener Communications** has introduced the 1834 digital audio subcarrier demodulator, providing near CD-quality audio reception through a single subcarrier 128 kilobit data channel.

The unit utilizes MPEG compression technology to give users the choice of a single stereo channel or two mono channels in approximately half the transponder bandwidth required for a single mono analog channel. A robust QPSK demodulator and a 3/4 rate FEC decoder are employed in the demodulator.

For information, contact Ken Leffingwell in Georgia at 404-623-0096; fax: 404-623-0698; or circle **Reader Service 163.**



### Mark Antennas' Truncated Antenna

**Mark Antennas'** new truncated eight-foot PT-65A96 antenna provides broadcast companies a way to cost effectively upgrade its systems from six-foot Category B to Category A performance.

The design of the PT-65A96 meets FCC Category A performance specifications, yet has a windloading factor no greater than a six-foot solid antenna.

The model provides the half-power beamwidth of an eight-foot antenna, with the gain of a six-footer (39.5 dBi at 7.0 GHz). It's also available in 2 GHz and dual frequency (7 GHz and 13 GHz) versions.

For information, contact Al Crego in Illinois at 708-298-9420; fax: 708-635-7946; or circle **Reader Service 27.**

### Remote-Powered Condenser Microphone

**Audio-Technica U.S.** has introduced the AT859QML UniPoint podium microphone, designed to replace the AT837QML microphone. The new microphone has a frequency of 50 Hz to 18 kHz and a maximum input sound level of 145 dB SPL.

The model features a "quick-mount" design, with a three-pin connector at its slim base to mate with a three-pin panel jack.

Optional accessories available include the AT8103 metal windscreen, the AT8104a pop filter.

For information, contact Garry Elliott in Ohio at 216-686-2600; fax: 216-686-0719; or circle **Reader Service 129.**

### Transmission Limiter 4000

**Orban** has introduced its new transmission limiter model 4000, designed for broadcasters who need to protect their transmission medium from overload.

Applications include network audio distribution, protection of digital audio systems from overload, and overmodulation protection for stations which desire no processing.

When driven into 15 dB of limiting, even when its HF limiters are working, listeners can compare input to output and not hear the difference.

The 4000 features a front panel design that is optimized for simple, error-free setup, with only input and output level controls, and switching for the built-in line-up tone generator that ensures quick and accurate level setting.

For information, contact Phil Moore at 510-351-3500; fax: 510-351-0500; or circle **Reader Service 82.**

# Products & Services Showcase

For more information on the products shown below, circle the appropriate Reader Service No.(s) on the enclosed Subscription/Reader Service card or contact the advertiser directly.

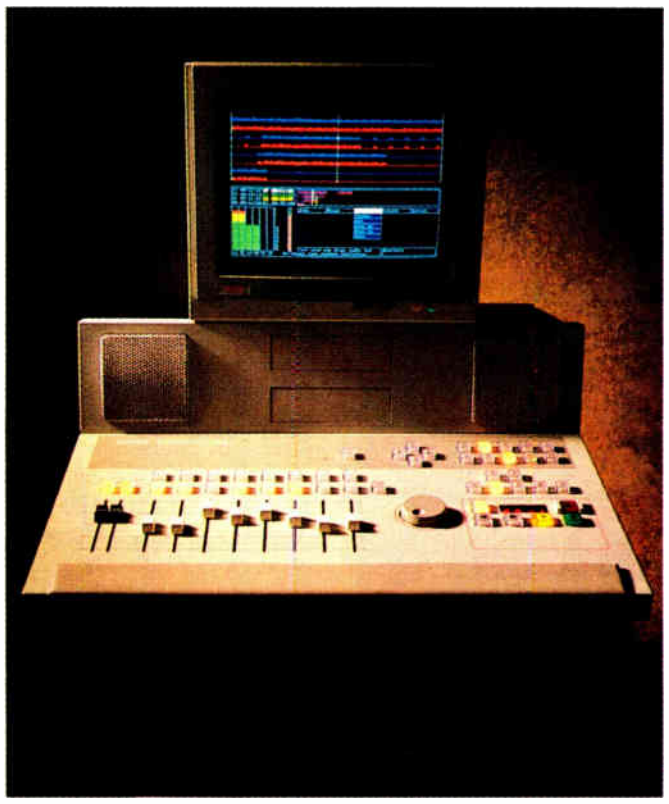
# To Make Money in Radio Advertising, You've Got to Push the Right Buttons.

Since 1990, radio stations in every music market have been more creative, more efficient and more profitable with the


DSE 7000. In order to increase profits in the competitive radio environment of the '90s, general managers have been asking more from their production directors, who in turn have had to do things faster and cheaper. Clearly, the trusty 8-track recorder wasn't going to lead radio stations through this new era.

Since it was impossible to become more efficient at tape splicing,


astute production types contemplated digital technology. They found out about a company with over 40 years experience manufacturing professional audio products, who was already shipping a digital sound editor for radio production. Not coincidentally, this system had many of the same controls and functions they were used to.

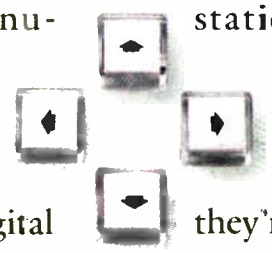


They tried a demo of the DSE 7000


and realized they could produce spots in one-third the time. Which meant they had time for a certain luxury called creativity.


The DSE's UNDO button gave them room to experiment. And its audio quality raised their standards to an entirely new level.

Today, hundreds of radio stations are making more money producing radio commercials, because they're pushing buttons on the DSE. Now it's time to push some buttons on your telephone and call AKG.



AKG®

## DSE 7000 • The New Speed of Sound™

**AKG Acoustics, Inc.** 1525 Alvarado Street, San Leandro, California 94577, USA, Tel: (510) 351-3500, Fax: (510) 351-0500



Circle (169) On Reader Service Card

# Dielectrics Are Key to Capacitance

*This is the sixth in a 10-part series called* Fundamentals of AC. *Northern Virginia Community College will offer 1.2 CEUs (Continuing Education Units) to registered students who successfully complete the course and an examination mailed at its conclusion.*

*To register, contact the Community Education Office, Annandale Campus, 8333 Little River Turnpike, Annandale, Va. 22003, or call 703-323-3168 or 323-3528. The fee for the course is $30.*

**by Ed Montgomery**

**Part VI**

**ANNANDALE, Va.** Capacitors take their name from the word capacitance, which means the "ability to hold." Capacitors hold and store electric charge. It its simplest form it consists of two metallic plates separated by an insulator as previously discussed.

Capacitors are manufactured in several types and sizes to meet different design requirements. They are generally classified into three areas: Fixed, Electrolytic (polarized), and Variable.

All capacitors depend on their dielectric or insulation to separate their plates. The dielectric's ability to insulate can be determined. A reference for dielectric strength is air and it is given the numeric figure one.

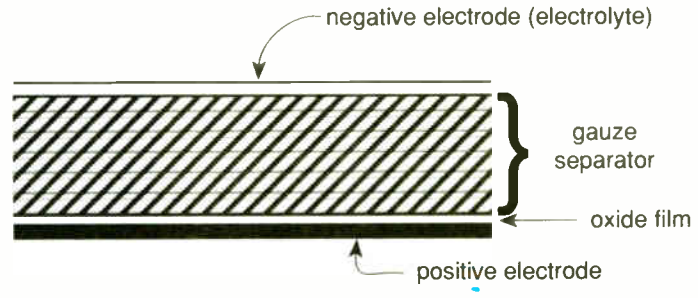
Another dielectric often used is mica. Mica has a dielectric of six. This means that mica can provide six times the insulation of air when the capacitor's plate dimensions and voltage application remain the same. Ceramic dielectrics can be in the 80 to 1200 range.

All dielectrics reach a point where their insulating ability breaks down and an electrical arc occurs. The best example of this in nature is the lightning bolt during a thunderstorm. As previously mentioned, opposite charges are built up in the cloud and on earth, with air being the dielectric. Electric charge continues to build until the air's ability to act as an insulator is exceeded, resulting in the production of lightning.

Fixed capacitors are often made of mica and paper. Mica is an aluminum silicate material that is placed in strips between plates. The entire capacitor is packaged in bakelite. Often mica capacitors are used in small devices of 10 to 2000 picoFarads.

Paper capacitors are probably one of the oldest types made. The outside leads connect to rolls of tin foil, which act as plates. The dielectric is paper. Paper capacitors are usually encased in cardboard or plastic. Older paper capacitors were sealed in wax. Paper capacitors are usually manufactured in the .0005 to 1.0 microFarad range.

Figure 1.




### Ceramic dielectric

Ceramic capacitors employ ceramic materials for their dielectric. Ceramic discs have silver fired onto the dielectric to form the plates. Because ceramic capacitors have a very high dielectric constant, they can store their charge in small areas.

Another type of fixed capacitor is the electrolytic. Electrolytic capacitors have the ability to store a great amount of charge in a small area. They are usually used for values of 1 to 10K microFarads.

Electrolytic capacitors are often used in circuits that use DC or both DC and AC. The DC voltage established the proper polarity for the capacitor to operate, while AC can be passed on top of the DC electricity. This creates a pulsating or varying DC signal.

Figure 1 is an illustration of the construction of an electrolytic capacitor. In this illustration two aluminum plates are placed in an electrolyte consisting of borax, phosphate, and carbonate. When a DC voltage is applied, the gauze attracts electrons that produce an oxide film.

This action is a form of electrolysis. Charge is stored between the positive terminal and the gauze. The negative terminal is usually the outer case and carries the charge away from the electrolyte when connected in a circuit. The dielectric is actually a thin oxide film within the capacitor that permits a great amount of charge to be built up in the gauze.

If the polarity of an electrolytic capacitor is reversed, the chemical reaction within the capacitor will create gas, heat, and often an explosion.

Tantalum capacitors are another form of an electrolytics. They employ tantalum as a dielectric which permits a greater charge to be stored in smaller areas.

Most capacitor values are stamped on their case by the manufacturers. However, many older capacitors and some newer ones still employ a color code. This code can be found in most technical handbooks.

### Variable capacitors

Variable capacitors are used in radio frequency applications. They consist of two sets of metal plates with air acting as the dielectric. One set of plates rotates within the stationary plates, varying the amount of charge stored in the device. Many receivers use this device to tune in desired radio signals.

Capacitors have voltage and current characteristics that are exactly opposite those of coils. This permits capacitors and coils to be used in tuned circuits in transmitters as well as in receivers. Capacitors have the ability to pass AC but block DC from getting through them. Electrostatic charge in capacitors play an important role in today's electronics.

Capacitors can be checked quite easily with many of the multimeters that are on the market today. These meters have a capacitor checking position on them indicating the amount of charge they are capable of holding. Capacitors can often be checked with an ohmmeter as well. They should exhibit an infinite amount of resistance, indicating they are not shorted. However, the ohmmeter test will not tell you if the device is open. Ohmmeter measurements of electrolytics will indicate an initial low amount of resistance, but as the chemical reaction within builds up charge, the resistance will rapidly increase to a very high amount.

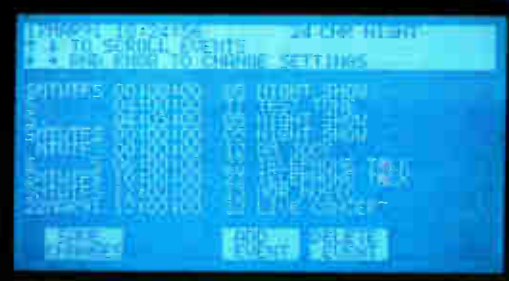
All capacitors suffer from leakage. After the voltage on their plates have been removed, the charge will diminish. Leakage varies for different types of capacitors. As electrolytic capacitors age the chemical reaction within them often produces "whiskers." These are small metallic projections that grow across the dielectric area.

The current flow within these "whiskers" will produce a gas build up. This will cause the device to swell, possibly leak, and ultimately fail. If you observe this condition, it is time to replace the capacitor.

□□□

*Ed Montgomery is a communications teacher at Thomas Jefferson High School for Science and Technology. He has taught broadcast engineering at Northern Virginia Community College and can be reached at 703-750-5090.*

# PURE DIGITAL.

Use the 8200's Automatic Preset Switching to automatically change the processing on a programmed schedule. Ideal for dayparting or multi-format stations.

## Bottom Line Orientation.

Creating a "sound" that attracts and holds the largest possible audience is the bottom line in the radio business. And the new OPTIMOD-FM Digital 8200 is a technological breakthrough with bottom line impact.

## Digital Makes the Best Even Better.

The power of digital propels the 8200 to new levels of performance and functionality. OPTIMOD-FM 8200 is a *true* digital audio processor—the audio is digitized and all control functions are digital.

What is the value of digital processing and control? In addition to a better sound, digital makes the OPTIMOD-FM more user-friendly, more programmable, more flexible. Simply put, because the OPTIMOD-FM is easier to adapt to a station's programming needs, it will produce more benefit, more of the time.

## The Processor with Multiple Personalities.

With most conventional processors, multiple processing configurations require multiple boxes. With the 8200's Multiple Variable Processing (MVP) architecture, processing configurations can be changed with the push of a button—select the protection MVP for total transparency, or the two-band MVP for an improved version of the traditional open, bright and natural OPTIMOD-FM sound which helped make thousands of stations successful. Choose the optional multi-band MVP and meet the challenge of competitive major-market processing with selectable speeds to match any format.

## Power. Potential. Profitability.

Take advantage of the power, potential and profitability of the OPTIMOD-FM 8200. Call your dealer now for a personal, hands-on evaluation of the 8200.

The OPTIMOD-FM 8200 is a technological breakthrough with bottom line impact. The power of OPTIMOD— in pure digital.

OPTIMOD-FM
DIGITAL

orban

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Circle (31) On Reader Service Card

# *Be Prepared: Your Local Scouts Merit Attention*

## FROM THE TRENCHES

*by Alan Peterson*

Dear Alex,

Man, am I tired of having a winter beard. Thankfully I've already gone through the Ringo Starr stage (ratty stubble), the Don Johnson phase (allegedly sexy stubble) and the Maynard Krebs look (comical stubble). The Sociology Professor stage will eventually come, where the beard will be trimmed and maintained to a point it would look complete with a pipe and elbow-patched jacket. Having this dead ferret on my face is as much work as owning a used reactor.

Happily, visitors to my station are tolerant of my appearance. And this has been a very busy season for visitors—hail and farewell to Scout Troop Tour Time for another year.

We always welcome and encourage tours here, as any station interested in the community would be. Tours may not get you on the photo pages of the trades, but they do make you best buddies with the public you serve.

A visit to your friendly neighborhood AM/FM combo is a natural for a scout pack. Plus, it earns scouts a badge in communications...big change from my days with Pack 9 on Long Island when I built a crystal set that picked up WTHE Mineola, N.Y. No real effort actually, since WTHE was six blocks from home.

The typical sequence of a tour at WLAD(AM)-WDAQ(FM) aims to give the kids a fun taste of what it's like to work in radio. First comes that four-flight walk up from the office to the studios.

The initial stop is the newsroom where they get to see a newscast written and prepped. Here is where the kids earn the badge, so lots of questions are encouraged. Police scanners, AP wire and Mutual net feeds are all given their due here, as well as explaining the standard NAB tape cartridge for the first time.

The real tough question comes from the Den Mother who wants to know why the newsroom TV has the *soaps* on. Ever try to explain a Secondary Audio Program (SAP) track to somebody? It's not easy, especially when the channel isn't sending anything. Our channel 30 airs a statewide news network on its SAP. But I always end up looking like a liar when the SAP mutes out.

Next stop: WDAQ(FM), to meet the jock and see how their favorite music station gets on the air. Our Pacific console and reel decks always impress 'em. One kid even came up with a term that just may find its way into the next Denon print ad...

We have three Denon DN-950FA decks in our FM studio, and when I demonstrated the CD cartridge's sliding aperture, the kid called it a "Popeye Door"—a reference to the animated hatch in the opening credits of the old Max Fleischer cartoons. Such are the humble origins of generic terms (can you imagine the ad? "Denon's new improved cartridge for 1993, with smoother Popeye Doors...").

Down the hall to WLAD, and the explanation of why Mom and Dad listen to it all the time. The definition of *full-service* is over their heads—all they know is "we talk a lot." Here is normally the place I get asked, "Is XXX (insert name of jock from competing station) coming in today?" Sometimes, "Can you play XXX (some rap tune I've never heard of consisting of samples I have heard)?"

Production is our final stop, where I demonstrate the behind-the-scenes trickery that goes into our spots and promos. Sound effect CDs are always a hit, especially the train wreck on the Hollywood Edge demo disc. Hearing their voices processed through my ART Alpha 2 DSP gives them a thrill (watch for some of my favorite programs written for this box in a future installment of *Studio Sessions*).

The final thrill happens 30 minutes after their departure when I spring my ultimate showstopper on them. Halfway through the production session, I get a kid to put on the cans and talk up a song "just like a real live DJ!" After the initial hesitation, they all want to try it.

Some of the things the under-13 set considers vital to listeners astound me, from "I hate my teacher," all the way to "send all your Gameboy cartridges to me here at dub-yuh-L-A-D." There is the occasional glimmer of a future performer announcing, "Here's Paula Aldoob, live from her Pepsi commercial," except it's Ab*dul* and she works for Diet Coke. It's only moments from their departure when I tell them to listen to WLAD on the way home, when (to the thrill of some and the stark horror of others) they'll hear the "audition" on the air, edited into a montage. Oh, Alex, if you only knew how much pleading and how many bribes this creates.

Getting exposure to the magic of the biz early on can help sustain it for the future. I only wonder what's waiting in the wings for that one kid who gets hooked on a tour and makes radio a career 10 years down the road. In the meantime, he or she (we've done Brownie Troops, too) will play that cassette to death and stop on up to the studios more and more. It's worth that hour out of the day.

For anyone reading this note to you, Alex, I say it's essential to the goodwill of the station and the community to handle a tour now and again. I mean, Cub Scouts can tour the dairy and the botanical gardens just so many times before it gets to them.

Line Up in Size Order,
—Al

□□□

*Al writes from WLAD(AM)-WDAQ(FM) Danbury, CT 06810. If you want some advice on setting up a tour for your station, reach him at 203-744-4800.*

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# Radio World

# Broadcast Equipment Exchange

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## AMPLIFIERS

### Want To Sell

**RCA MI 11204** line, tube. J Munn, Oroville Radio, POB 1340, Oroville CA 95965. 916-533-3700.

**RCA, Altec, Dynaco** tube amps, sell of trade. Tracy Eaves, 615-821-6099 (evenings before 10PM EST).

### Want To Buy

**Altec/Dynaco/RCA/McIntosh**, buy/sell/trade mics/spkrs. N Erickson, Rainbow Rcdg, 2322 S 64th Ave, Omaha NE 68106.

## ANTENNAS & TOWERS

### Want To Sell

**Bird 8922** 1 5/8" 5 kW dummy load. S Cichorsky, Paso Bdcters, POB 2031, Paso Robles CA 93447. 805-239-3916.



**Crouse Hinds** 500 W beacon, (2) side lamps, gd cond, $800+s/h. T Callahan, 5913 Bermuda, Boise ID 83709.

**ERI 37 CP** 6-bay FM w/300 W heaters, 100.7 MHz; Andrew 84147 3" heliax, 80' piece, new. P Phillips, WMGI, POB 3190, Terre Haute IN 47803. 812-533-2141.

**ERI 3-Bay** rototiller, medium power, excel. 816-635-5959.



**Myat 3 1/8"** switch, 3-port, new, $500; 1-3 1/8" female N reducer, new, $100. M Mayhugh, 304-485-7354.

**Delta 6730E** 1 5/8" coax ant xfer motorized switch. S Cichorsky, Paso Bdcters, POB 2031, Paso Robles CA 93447. 805-239-3916.



**Celwave CLP-5** FM on 106.3 MHz w/face mount brckts. L Nixon, Classic City, 1094 Baxter St, Athens GA 30606. 706-613-6724.

**Gates/Harris FMC** w/new radome, $150; ERI facemount for 4-bay, $250. D Vernier, KUNI, Univ No IA, Cedar Falls IA 50614. 319-273-6400.

**Utility 340**, 9 sections, 1 tapered base section, 1 half section tube leg, painted, on the ground, no base insulator or hrdwr, approx 210' overall, $3500 +ship. Clif or Steve, KROP, 120 S Plaza, Brawley CA 92227. 619-344-1300.

**Rohn 45-G**, 340' with lighting package, BO. Call 314-687-3932.

**ERI M-1105-2A** 2-bay FM, 97.7 MHz, $1200; ERI 5-bay FM horiz, 102.5 MHz, $1000; 75' of 1 5/8" coax w/1 5/8" EIA flanged conns, $500; 45' of 1 5/8" coax w/conns, $350. G Kenny, KCL, POB 932, Neosho MO 64850. 417-451-1440.

**Moseley TLK-2** new twr light kit. C Springer, KSEC, Box 390, Lamar CO 81092. 719-336-2206.

**AM phasing** components, caps & coils, used. T McGinley, WPGC, POB 10239, Washington DC 20018. 301-441-3332.

**Potomac Instr AM-19** 5-twr DA-2 ant mon, $2000. J Morris, WLYF, 20450 NW 2nd Ave, Miami FL 33169.



**Gates FMA-6A**, tuned to 105.1, $500/BO. J Boswell, WKOZ, POB A, Kosciusko MS 39090. 601-289-1340.

**Shively/ERI** 6/7-bay tunable to 95.1 & STL w/dishes. M Grubbs, KATG, POB 1047, Luling TX 78648. 210-875-2555.

**dbx 150** 2-channel noise reduc, works great, $100. A Gregory, 415-285-1953.

**TCI 611** shortwave, 4x4 curtain, 20-22 dDi gain, 6-12 MHz, slewable, 30 degrees, 500 kW capacity. L Entz, KGEI, 1406 Radio Rd, Redwood City CA 94065. 415-591-7374.

### Want To Buy

**Rohn 55** 130'/(13) 10' sections; 12-bay tuned to 92.3. R Whitlock, KITE, 838 G Sidney Baker, Kerrville TX 78028. 210-792-4560.

**4-8 bays** on 91.7; 400' of 1 5/8" line; FM antenna, pref Shively. M Taylor, KENO, 700 Spencer Dr, Neosho MO 64850. 605-224-1240.

**Rohn SSV** self-spt 60'. J Vine, Vine Comms, 2845 Airway Ave, Kingman AZ 86401.

**6-bay circ pol**, pref Phelps-Dodge; 3-by circ pol, both on/near 92.3 MHz; Moseley PC505C receivers on/near 949 MHz. K Diebel, KTJC, 1207 Louisa, Rayville LA 71269. 318-728-5852.

**Rohn 55** 10' sections, 17-20' sections; 12-bay, any make tuned to 92.3 MHz, low pwr, will pick up. G Baker, KITE, 838 G Sidney Baker, Kerrville TX 78028. 512-792-4560.

## AUDIO PRODUCTION

### Want To Sell

**Soundcraftsman** (2) SG-2205-600 graphic EQs, $75 ea; (3) Pultec EQP-1A3 EQs, $95 ea. D Vernier, KUNI, Univ No IA, Cedar Falls IA 50614. 319-273-6400.

**CRL Dynafex DX-2** single-ended noise reduc, downward expander, like new with manual, Best Offer; Hughes AK-100 Sound Retriever stereo enhancer/synth, sound retrieval, new, BO. T Alexander, WDOK, 1 Radio Ln, Cleveland OH 44114. 216-696-0123.



**Ramsa WR-8416** new w/(7) mono & (4) stereo input mods, $5000. R Baur, KYTT, 414 4th St, Fairbury NE 68352. 402-729-3382.

**Orban 787A** prog mic proc w/rem ctrl, $700; 622B para EQ, $600, both new cond. J Somich, Somich Prods, 1208 Stoney Run Trail, Broadview Hts OH 44147. 216-546-0967.

**Eventide** audio delay, up to 10 sec for talk show/phone calls, $3850. S McGrath, WGNY, 429 Little Britian, New Windsor NY 12558.

**dbx 563** The Silencer, excellent condition, BO; Vega Pro wireless mic & rcvr, excellent condition, BO. B Cannella, Intl Bdct Ntwk, POB 36096, Denver CO 80236. 800-426-4272.

**dbx 140X** (3) 2-chnl type II noise reduc units, BO. J Coursolle, 414-236-4242.

**Arrakis Digilink II**, mint cond, can re-warranty, $7000. J Hart, Radio Genesis, 13701 W Jewell Ave #111, Lakewood CO 80228. 303-987-1211.

**CRL PMC 450** lk new $1500. G Patschke, KIJN, Box 458, Farwell TX 79325.

**Orban 111B** reverb unit, exc condition, $500. L Wilkins, WLWI, POB 4999, Montgomery AL 36104. 205-240-9274.

**Ashley SC55** stereo comp limiter; NEI 342 para EQ; Ashley SC68 para notch filter, $100 ea. V Huey, NGP, 513 W 54th St, NY NY 10019. 212-246-1517.

**Prophet 600** synth, $450; **Spectro Acoustics** rk mt 200 W amp, $150; **Crown VFX2** electronic crossover, $125. W Gunn, 619-320-0728.

**AKG 414 P48** like new, $675; **Dynaco 410**, 400 W amp, $400; **dbx 1BX** expndr, $135. W Gunn, 619-320-0728.

**SKL Hi/LO** variable filter (pair), $200. W Gunn, 619-320-0728.

**TT (Bantam)** ADC patchbays, 144 pts, 1 rack sp, $129; **Tannoy HPB385A** 15" coaxial monitor pair in cabinet, $1750; **Altec 436A** tube cmprssrs, Daven attn, both $700. W Gunn. 619-320-0728.

**Roland SPH323** phaser, $75; **Rockmann** sustainer & stereo chorus/delay, $350/both. W Gunn, 619-320-0728.

**MCI JH110A** 2-trk in stand w/sound & vision rmt/locator, $1200; **Orban 674A** paragraphic stereo EQ, $600; **Fostex 3070** comp/limiter, $150; Foxtex 3180 reverb, $50. W Gunn, 619-320-0728.

### Want To Buy

**Dolby B** ext proc for cassette dup, box/rack mount. M Sokkol, JMS Prods, 121 E Baltimore St, Hagerstown MD 21740.

**TEAC Dolby B** noise encoder-decoder w/manual, working. 305-887-5329.

**Ampex MX10** or MS 35 mixers. W Gunn, 619-320-0728.

**Fairchild 600 conac** or 602 Conex high freq limiters. J Gangwer, 942 32nd St, Richmond CA 94804. 415-644-2363.

## AUTOMATION EQUIP

### Want To Sell

**Format Sentry** w/Otari ARS-1000, less than 2 years old, excellent condition with ime Sentry, will sell Otari separately. B Cannella, Intl Bdct Ntwk, POB 36096, Denver CO 80236. 800-426-4272.

**Systemation X7** on-air & prod brain, 15 cassette decks, 2 Commodore 64 kybds, 2 mons, very good cond, $4000. S Greeley, Mad Dog Wireless, 1845 McCulloch Blvd A14, Lake Havasu City AZ 86403. 602-855-1051.

**Shafer 903**, $1950. S McGrath, WGNY, 429 Little Britian, New Windsor NY 12558.

**SMC DP-1**, DP-4, USI, (6) SMC 350's, (2) SMC 250's, quad-cart in slider, dual-chnl tone decoder, Revox A-77 PB, AS-20 w/aftermkt PC's, blueprints & lit, $3000. P Starr, KYKK, 619 N Turner, Hobbs NM 88240. 505-397-4969.

**Otari ARS 1000** (4) w/25 Hz tone detectors, PB, exc cond, $650 ea/BO pckg; Programmer 2A auto sequencer for (4) ARS 10000 R-Rs, $395/BO. J Hansen, WYRQ, 70 SE 1st Ave, Little Falls MN 56345.

**SMC MSP-12** keybd, mon, brain, switcher, (3) Carousels, (2) racks, $4000. D Hughes, WZLT, 584 Smith St, Lexington TN 38351. 901-968-9990.

**Schafer 902** w/spare cards, manuals, Epson printer, remotes, (3) SMC 250 24-cart Carousels, Ampex 440 deck, ABC Kartel ctrler, $1000/BO+s/h. D Jackson, KSLO, 2300 Portola Dr, Santa Cruz CA 95062.

**SMC 350** (6) stereo Carousels, $600 ea; SMC DP-2 computer w/DS-20 switcher, $500. P Swint, KIXQ, 2620 Dogwood Rd, Joplin MO 64801.

**Format Sentry** syst w/FS-12C switcher, (4) Scully stereo R-Rs, (2) 48-tray mono Instacarts, (2) wired racks, AT&T comp w/opto automation card, software, manuals, gd cond, $5000. L Wilkins, WLWI, POB 4999, Montgomery AL 36104. 205-240-9274.

**SMC DP-2** (4) Carousels, (4) R-Rs, assoc equip & new SMC Otari deck, BO; SMC DT-4 cart encoding data trmlnal w/CRT, BO. C Springer, KSEC, Box 390, Lamar CO 81092. 719-336-2206.

**IGM EC 1989** w/cntrler, Samsung PC progrmr, (3) 250 Sono-mag Carousels, interfaces, $2500. J Parman, WRNZ, 324 W Main, Danville KY 40422. 606-236-7106.

**SMC 350 Carousel**, exc cond, many, $175 ea. S Horner, KMRO, 2310 Ponderosa, Camarillo CA 93010. 805-654-0577.

**Bdct Automation** Live Assistant controller, 1 1/2 yrs old, 24 events of prog, ctrls carts, CD players, reels, like new w/manual, $950. R Chambers, KSUE, 3015 Johnstonville Rd, Susanville CA 96130. 916-257-2121.

**Complete system** w/(3) A77 Studer R-Rs, (3) Persons dual 25 Hz tone processors in 19" cabinet, Persons Prog 3A ctrler, Audi-Cord A36 twin deck plyr, manuals, $2500/BO+s/h. J Boswell, WKOZ, POB A, Kosciusko MS 39090. 601-289-1340.

### Want To Buy

**Systemation Superswitch** (2), gd cond. G Finney, WPWB, 7137 Heather Ln, Macon GA 31206. 912-788-2124.

## BUSINESS OPPORTUNITIES

### Want To Sell



## CAMERAS (VIDEO)

### Want To Sell

**JVC KY-310** in Anvil case w/port VP-4400LU & cables, very clean, $2100. R Millman, MW, 550 W 43rd St, NY NY 10036.

### Want To Buy

**RCA TKP 45** ctrl cable & manual for camera & CCU. G Kirby, Gray Fox Video, 13613 US 36, Marysville OH 43040. 614-261-8871.

## CART MACHINES

### Want To Sell

**Micro Maxx** (2), mint cond w/rack mounts, pwr cords, manuals, $1600 both. K Rosato, Sound Bdctg, 303 Webster Ave, New Rochelle NY 10801. 914-235-5939.



**Tapecaster 700P** (2), $250; RPC, parts only, $50. T Crockett, Hot Tracks, POB 10501, Blacksburg VA 24062. 703-953-0222.

**Spotmaster AD1B**, mono DA, $100. D Vernier, KUNI, Univ No IA, Cedar Falls IA 50614. 319-273-6400.

### CART MACHINES...WTS

**ITC RP** rack mount w/new hds, mono GC, $300. K O'Malley, WLTY, 4416 Mallard Crescent, Portsmouth VA 23703. 804-446-2731.

**Audicord** dual R/P, 2 yrs old w/o record func, PB only, BO. B Cannella, Intl Bdct Ntwk, POB 36096, Denver CO 80236. 800-426-4272.

**Tapecaster** T100RP, $100; 700P, $50; Ampro R/P w/FF, $200. B Evans, CMN Music, 156 Prospect St, Wilkes Barre PA 18702.

**BE Series 3000** mono PB w/3 tones, gd cond, $350. G Gabriele, WFOG, 215 Brooke Ave, Norfolk VA 23510.

**SMC MaCarta 190** (3), $200 ea. J Morris, WLYF, 20450 NW 2nd Ave, Miami FL 33169.

**Tapecaster X700 RP**, (5) Audi-Cord Signature series twin decks w/11 cart slots, $1995/BO+s/h. J Boswell, WKOZ, POB A, Kosciusko MS 39090. 601-289-1340.

**Ampro CT-2504** (2) mono PB, $250 ea. T McNally, WMID, 1825 Murray Ave, Atlantic City NJ 08401. 609-344-0300.

**Fidelipac CTR-112** PB, little use, exc cond, $1800/BO. D Irwin, 510-254-4179.

**BE 2100** (2) stereo, play, $600 ea+s/h; BE 2100 CRPS, $1000+s/h, both very gd cond w/manuals. F Spinenta, KCEA, POB 2385, Atherton CA 94026.

**ITC Omega** (4) stereo PB, exc cond, $700 ea. J Chidester, Radio Tech, POB 1897, Glenwood Sprgs CO 81602.

**Dynamax CTR-12** stereo-play, like new w/manual, $850. D Igou, 8435 Twisted Oaks, Garden Ridge TX 78266.

**BE 3000**, mono, R/P, $400. S Keefe, WCNI, CT College, New London CT 06320. 203-447-1296.

**Spotmaster 906-2021** stereo R/P, $150; Sparta 4620 Century Series stereo R/P, $100. A Crane, KFLG, 1343 Hancock Rd, Bullhead City AZ 86442. 602-763-2100.

**MaCarta** (2) R/P; Harris Gates, BO. Mark, 308-382-2800.

**ITC Delta I** (3) stereo PB, gd cond, $1100 ea+s/h. E Trevino, 210-544-1600.

**Spotmaster** 500C R/P & 505C play, clean, working, $500 both. M Ripley, KOZE, POB 936, Lewiston ID 83501. 208-743-2502.

**BE 5300C** tripledeck, stereo, PB, mint less than 50 hrs, BO. R Kaufman, Pams Prods, POB 462247, Garland TX 75046. 214-271-7625, after 3PM CDT.

#### Want To Buy

**ITC 99B** & (3) Delta I PBs, gd clean cond, stereo. T McGinley, WPGC, POB 10239, Washington DC 20018. 301-441-3332.

## CASSETTE & REEL-TO-REEL RECORDERS

#### Want To Sell

**Tascam Mdl 32** 2-trk, exc cond, $975; Mdl 32-3B, 2-trk, gd cond, $500; Studer B-77, 2-trk, gd cond, $395. R Herman, Frontier Radio Ntwk, POB 9292, Austin TX 78766. 512-258-9292.

**Scully 280** 8-trk 15-30 ips, rem ctrl hd, roll-around cab, gd hds, manual. L Nixon, Classic City, 1094 Baxter St, Athens GA 30606. 706-613-6724.



**Tascam 122** (2) stereo cass decks, lots of use, decent cond, BO; (3) BSR EQ-3000 EQs, approx 3 yrs old, exc cond, $50 ea. B Cannella, Intl Bdct Ntwk, POB 36096, Denver CO 80236. 800-426-4272.

**Ampex 350** (2) w/Inovonics electrs, $300 ea; AG-350, $500, both mono w/solid state elects & rackmount. A Baker, Bdct Prods, 804 E 38th St, Indianapolis IN 46205. 317-925-7371.

**Otari MX-7000** (2) w/stands, $75 ea; Magnecord 1021, $175; Dictaphone 400 logger, $400; TEAC C3-RX, parts only, $25; Scully 280 w/stand, $450; Ampex 104 w/4-trk & 2-trk hds, $2500; (2) Ampex 102 2-trks 1/4", $1200 ea. D Vernier, KUNI, Univ No IA, Cedar Falls IA 50614. 319-273-6400.

**Tascam Mdl 32** 2-trk, great cond with orig pckg & manual, $700+s/h. G Parmelee, Music Svcs Unltd, RR 1 Box 1020, Brandon VT 05733. 802-247-5528.



**Sparta R/P 200** in wood rack, missing pts. J Munn, Oroville Radio, POB 1340, Oroville CA 95965. 916-533-3700.

**Otari MX-5050** full-trk rec w/2-trk PB, GC, $400/BO. K O'Malley, WLTY, 4416 Mallard Crescent, Portsmouth VA 23703. 804-446-2731.

**Scully 280** parts w/motors, cards; 8-trk 1" R/P combo hd & erase hd to match for Scully 100; Inovonics Tentrol units; Tascam duplicators, T-2640, 8:1 spd, 3 slaves, cass:cass, expandable. R Robinson, TNA Rcdg, 10 George St, Wallingford CT 06492. 203-269-4465.

**Fostex Mdl 80** 8-trk, very gd cond, $900. J Edick, Pelican Prods, 2101 Peck St, Muskegon Hghts MI 49444. 616-722-3012.

**Tascam 42B** 2-trk, console stand, new, $1800/BO. B Dombrowski, Brian Dee Prod, 10356 W Warren, Dearborn MI 48126. 313-584-9201.



**Tascam 234** Syncaset 4-trk w/dbx, 8-chnl AudioCentron mix down console w/reverb, DeltaLab/Yamaha effects proc, $1500/BO+s/h. J Boswell, WKDZ, POB A, Kosciusko MS 39090. 601-289-1340.

**Technics RS 10A02** 1/4" 2-trk, mint, $800; Crown 822 SX 1/4" 2-trk, $600. V Huey, NGP, 513 W 54th St, NY NY 10019. 212-246-1517.

**Tascam 58** 8-trk, 1/2", very gd cond, low hrs, XLR in & out, conns for SMPTE lockup w/video, svc manual, $3000. T Carroll, 212-340-7519.

**Otari ARS 1000** (4), exc cond w/manuals & 25 Hz tone sensor & cue tone relays, rack, $475, w/o rack, $400. R Chambers, KSUE, 3015 Johnstonville Rd, Susanville CA 96130. 916-257-2121.



**Revox PR99 MK II** (4), new, 1/2-trk stereo play w/25 Hz sensor, $1100 ea. D Peluso, KJUL, 2880 E Flamingo Rd #E, Las Vegas NV 89121. 702-732-2200.

**Sony BVU 50**, nds repair, $150; Ampex AG-440 1/4", 2-trk, stereo, nds meter, $200. G Kenny, KCL, POB 932, Neosho MO 64850. 417-451-1440.



**Otari MX5050** BQII-8, 8-trk, gd cond, $1500; MKII-4 4-trk, gd cond, $1000. L Wilkins, WLWI, POB 4999, Montgomary AL 36104. 205-240-9274.

**Otari ARS 1000** (4), $400 ea. P Swint, KIXQ, 2620 Dogwood Rd, Joplin MO 64801.

**Revox PR99** 2-trk w/roll around console & mon, exc cond, $100. G Frey, Graphic Sound Studio, 354 Rileyville Rd, Ringoes NJ 08551.

**Otari 5050B 4** 4-chnl, 1/4, line & mic inputs, sel-sync all chnls in 2 black cases, very clean, $675/BO; (3) new hds for Ampex 350 full-trk, $150/BO; (3) new hds for Scully 280 2-trk, $225/BO; Otari CR-7 5-button rem ctrl w/20' cable, $100/BO; Technics M-270X w/2 motors, Dolby & dbx noise reduc, florescent VU mtrs, very clean cond, $225/BO; Technics M-270-X rem ctrl, $25. L Snyder, Madera Bdctg, Box 182, Floral Pk NY 11001. 718-347-2940.

**Magnecorder** (2) R/P; Ampex; (2) Reovx A77s; TEAC 4-trk, BO. Mark, 308-382-2800.

**ITC 750** (4) 7.5 ips, stereo PB, clean, $300 ea/$1000 all. T McNally, WMID, 1825 Murray Ave, Atlantic City NJ 08401. 609-344-0300.

**Tascam 32** 2-trk & 38 8-trk, like new, $2000/both; **Teac 3340** 4-trk, 1/4" deck, $375; **Tascam 80-8** 8-trk never really used/perfect, $1600. W Gunn. 619-320-0728.

**MCI JH110B** 2-trk in factory console, $1500; (4) Ampex AG440C PB in Ruslang consoles, $800 ea; Ampex 351 full-trk, mono, Inovonics in Ruslang console, $500; Ampex AG-350 full-trk, mono, w/spare pts, $350; Metrotech/Dictaphone 400 low-spd log syst, 5 xports, 5 amps, 3 time code gener/decodrs, $1200. J Morris, WLYF, 20450 NW 2nd Ave, Miami FL 33169.

**Nakamichi 550** stereo w/pwr sply, case & manual, $400+s/h. F Spinenta, KCEA, POB 2385, Atherton CA 94026.

**Scully 270** 14" PB, 1 stereo plus 1 mono for parts, $200/both; **Ferrograph Super 7**, 10", 3-7-15 ips, 2 trk, $300. W Gunn. 619-320-0728.

**Tascam 40-4** w/dbx & flight case, $950; **Tascam 48** 8 trk, excel for sync, $2950. W Gunn. 619-320-0728.

**Otari Mark II-IV** 1/2" 4-trk, multi-trk, mint, less than 50 hrs, BO. R Kaufman, Pams Prods, POB 462247, Garland TX 75046. 214-271-7625, after 3PM CDT.

**Studer A810 1/4" 2 track** recorder on like new cond, less than 70 hrs. Installed options include set-up generator & tape marker & scissors. Over $9,000 new, will sacrifice at $3,800. Jeff Harrison at 413-467-3737.

**Ampex ATR800** mono, like new, $1200 & AG440-8 1" 8-trk; **Otari 7800** 1" 8-trk, $2900.W Gunn. 619-320-0728.

#### Want To Buy

**1/2" low cost recorder**, working, tube OK, under $250. Sean, Sabrina Co, POB 467, Mercer Isl WA 98040. 206-298-9030.

**Otari MK III-8** head bridge with out heads. R Robinson, TNA Rcdg, 10 George St, Wallingford CT 06492. 203-269-4465.

**Magnecord PT6-6A** rec amp, gd working cond. B Berry, Karavan Bdctg, 13 Montgomery Pl, Conroe TX 77284.

**Ampex ATR100 taperecorders** for parts. Circuit cards, heads, motors, machine parts, or electronic parts. Call 818-907-5161.

**Scully '100' recorders,** record/play amplifiers, 8, 16, 24 track heads. Sequoia Electronics, 1131 Virginia Ave, Campbell CA 95008. 408-866-8434.

## CD's/PLAYERS

#### Want To Sell

**Denon 950F**, (2), gd cond, $1100 ea+s/h. E Trevino, 210-544-1600.

## COMPUTERS

#### Want To Sell

**Tandy 2000** w/software, $375; Kaypro port, $200; Texas Instr 810 printer, $450. R Robinson, TNA Rcdg, 10 George St, Wallingford CT 06492. 203-269-4465.

**Tandy 4P** (3) ports, working, $100 ea//BO. J Boswell, WKOZ, POB A, Kosciusko MS 39090. 601-289-1340.

## CONSOLES

#### Want To Sell

**Ramko DC-5RA** rack mount, 5-chnl, mono, $100. K O'Malley, WLTY, 4416 Mallard Crescent, Portsmouth VA 23703. 804-446-2731.

**McCurdy PE-2600** solid state mono w/slider cntrls & (2) VUs, 12-chnl, gd cond, $200+s/h. G Kirby, Gray Fox Video, 13613 US 36, Marysville OH 43040. 614-261-8871.



**Gates 31-A** (2) 8-chnl with power supply. J Munn, Oroville Radio, POB 1340, Oroville CA 95965. 916-533-3700.

**Ramko XL 425** prog/aud, stereo, 15-input, 3 yrs old, $1000. M Murphy, KMSO, 725 Strand, Missoula MT 59801. 406-542-1025.

**Gately** 16x8 w/EQ on ea chnl, 4 effects buss, quad monitoring, Canon conns for line & mic inputs & outputs, custom console, $1000. A Baker, Bdct Prods, 804 E 38th St, Indianapolis IN 46205. 317-925-7371.

**Gates Stereo 80** audio, exc cond, $1250. D Vernier, KUNI, Univ No IA, Cedar Falls IA 50614. 319-273-6400.

**Tapco/100 M** stereo 10-chnl mixer, gd cond. B Cannella, Intl Bdct Ntwk, POB 36096, Denver CO 80236. 800-426-4272.

**SMC** 6-channel, 600 ohm, vy gd cond, $200+s/h. F Smith, 615-624-7126.

**Audiolabs Quantum QS-22** 12-chnl, very gd cond, XLR conns, slide pots, rem starts, $2000+s/h. P Robillard, WYLD, 2228 Gravier St, New Orleans LA 70119. 504-834-7745.

**Shure M267**, gd cond, $275. G Gabriele, WFOG, 215 Brooke Ave, Norfolk VA 23510.

**Auditronics** 24x16x4 console with Producers desk & 624-part patch; Orban 245 stereo synth; dbx 463x noise gates in rack mount; 3M Mincom 1/4" full-track in console; Scully 280 1/4" 2-track R/P, mono; Dynex 240 noise supp; Orban Mdl 526A; 622B 2-channel EQ; Aphex 602 aural exciter; Auditronics PEQ 82 dual EQ; Scully 280 1/4" full-track in console; 360 Syst programmable EQ with 28 memory; Lexicon 1200 time compressor; UREI 964 dig metronome; Burwyn DNF 1500A noise reduc 8K; Kepex rack with 5 Gates & 1 limiter; Scully 280 4-track 1/2", $5950. 202-338-0770.

**Ramko DC 38-85** 8-chnl, fair cond, $1500. D Rose, KAAA, 2534 Hualapai Mtn Rd, Kingman AZ 86401. 602-753-2537.

**Ward Beck L2042** 13 in, expand to 20, effects, send, EQ, solo each chnl, 6 out, separate mon mixdown, $10K/BO. J Morris, WLYF, 20450 NW 2nd Ave, Miami FL 33169.

**RCA BT-3-B** 9-pot board, some ext mods, $200/BO. D Jackson, KSLO, 2300 Portola Dr, Santa Cruz CA 95062.

**Arrakis 1505C** (2), 3 mos old, mint cond, 6-chnl mono, $3000 both; cart machines. J Hart, Radio Genesis, 13701 W Jewell Ave #111, Lakewood CO 80228. 303-987-1211.

**Spotmaster** 8-chnl; Ampro 6-chnl; Collins 212E-1, BO. Mark, 308-382-2800.

**RCA/Ampro BC-15** spot mono, solid state, clean, $350. T McNally, WMID, 1825 Murray Ave, Atlantic City NJ 08401. 609-344-0300.

**Gates Yard Board,** painted white, $300; **Bogen CSM** remote mixer, $125. W Gunn. 619-320-0728.

**Tascam M-216** 16x4x2, live/rec board, exc cond, $800. B Rico, Matrix Syst, 1056 Paula St, San Jose CA 95126.

#### Want To Buy

**10/12-chnl** dual stereo w/mix-minus for phone interface. N Nelkin, KLIN, 4343 O St, Lincoln NE 68503.

**RCA BC** 7A/8A/9A. G Patschke, KIJN, Box 458, Farwell TX 79325.

## DISCO & SOUND EQUIPMENT

#### Want To Sell

**Fostex 4030/4035** synch & synch ctrler, very gd cond, $1500. J Edick, Pelican Prods, 2101 Peck St, Muskegon Hghts MI 49444. 616-722-3012.

**TOA SM-60** (5), dual spkr w/stands, $75 ea. J Diamond, Blue Diamond, Box 102C Chubbic Rd, Canonsburg PA 15317. 412-746-3455.

**Fostex 3180** rack mountable stereo reverb w/pre delay, BO/trade UREI Cooper time cube. J Roper, Imperial Sound, 383 N Studio St, Terre Haute IN 47803.

**AKG R-25** w/cable & conn for BX-25 reverb unit, BO/trade. J Roper, Imperial Sound, 383 N Studio St, Terre Haute IN 47803.

# EMPLOYMENT

To place ads in this section, use the ActionGram form. To respond to box numbers write Radio World, PO Box 1214, Falls Church, VA 22041. Attn:_____

## POSITIONS WANTED

**Bdcter** desires to make contact w/owner of big signal station for pay radio concept, 813-844-3823.

**Engr w/12 yrs exper** seeks intl pos, heavy exp from DC to daylight, exc refs, SBE cert. AI, 214-516-1017.

**Exper & friendly**, highly-motivated knowledgeable adult communicator w/great prod skills sks stable opportunity, solid air work team plyr, AC/Oldies/C&W. Dave, 712-262-7954.

**PT DJ**, willing to learn & work for free, have restric oper permit, pref KY & R&B. 502-772-1503.

**Hard working** creative 7 yr vet seeks FT AT/PD pos at med/large CW/oldies mkt. Jerry, 503-258-2190.

**9 yrs exper** audio prod w/1/2 yr on-air news, AA degree, resume avail. 21801 Fairlane Cir, Huntington Bch CA 92646. 714-964-8040.

**On-air/prod**, any format, super voice, exper, SE/SW pref, benefits. J Glascock, 813-461-3192.

**Maint engr**, experienced, FCC licensed, CET 4 fields, radio/TV, NYC metro area pref but will travel, NGBER & NGRTE cert. M Rakoff, 114-41 Queeens Blvd #148, Forest Hills NY 11375. 718-591-3859.

**NY-based** musician/composer/engr/prod/MIDI w/Mac exper & knockout resume sks pos/freelancd music prod. Rick, 908-241-3275.

**20 yrs exper** in radio announcing/some sales, sks pos in No AR, E OK, So MO, W MS, No TX. 501-337-7218.

**Construction** & fix-it engr, will go anywhere, anytime, avail by day/wk/project, exc creds, US/foreign. 813-849-3477.

**Rockland County** NY/Westchester CT seeking FT porf inside sales/mktg, exper, proven track rec, refs, hardworking, aggressive, avail immed, $20K+comm. 914-425-2225.

## HELP WANTED



**Denver Chief Engineer** yearns to return to music radio. Strong on new AM methodologies and directionals. 14 yrs engineering, 12 yrs on-air. Lifetime license, B.A., other talents. Prefer Contemporary & Country formats. Avai now. Reese Hull, 303-623-8313.

## HELP WANTED



# DISTRIBUTOR DIRECTORY

The following distributors serving the broadcast industry would be glad to help you with any of your requirements.

**DISCO & SOUND EQIP...WTS**

**JVC 4-DD-5** CD-4 quad disc demod, unused, $125/BO. D Price, Audio Prod, 310 N Howard St #103, Alexandria VA 22304. 703-751-9346.

**Yamaha QX-5** MIDI sequencer w/MDF-1 disk drive for storage, $150 ea/$250 both; Roland SBX-80 MIDI synch box; SMPTE TC reader/gener, $400. P Cibley, Cibley Music, 138 E 38th St, NY NY 10016.

**Dolby 301** A-type stereo, discrete, $500. W Gunn. 619-320-0728.

### Want To Buy

**Heath/Maestro** Theremins, working/not; guitar effects & pedals. C Collins, Grunert Sound, 1977 S 74th St, West Allis WI 53219. 414-327-4141.

## FINANCIAL SERVICES

### Want To Sell

**EQUIPMENT Financing,** Lease Purchase Option. Need equipment for your radio, television or cable operation? New or Used. No down payment. Carpenter & Associates, Voice 501-868-5023 Fax 501-868-5401.

## LIMITERS

### Want To Sell

**Harris/Gates M-65403** Solid Statesman, mono, FM w/manual, $80. T Rosen, KBCC, 1129 Acacia Ave, Bakersfield CA 93305. 805-871-6094.

**Aphex Type C** aural exciter, excellent condition, BO; Symetrix TI-101 telephone interface, excellent condition, $250. B Cannella, Intl Bdct Ntwk, POB 36096, Denver CO 80236. 800-426-4272.

**CBS Labs** (2) 410 FM Volumax, $150 each; 4110, $295; 4450A FM Audimax, $245; Moseley SCG-3T stereo gener, $200. D Vernier, KUNI, Univ No IA, Cedar Falls IA 50614. 319-273-6400.

**Gates SA31,** tube. J Munn, Oroville Radio, POB 1340, Oroville CA 95965. 916-533-3700.

**Marti CLA-40H** mono, A+ cond, trade 1/2", working $200. Sean, Sabrina Co, POB 467, Mercer Isl WA 98040. 206-298-9030.

**Orban 424/A** dual-chnl comp/lmtr de-esser, mint cond, $600. A Gregory, 415-285-1953.

**Orban 9000-AM Optimod NRSC** in exc cond. Call 816-635-5959.

**UREI 1176LN** mono peak, $450; Mdl 1178 stereo peak, $650; Mod Sci CP-803 comp clipper with rack mount, $350, all exc cond. J Somich, Somich Prods, 1208 Stoney Run Trail, Broadview Hts OH 44147. 216-546-0967.

**UREI LA-3A** compressor/limiter stereo pair (2), $1000; **Lexicon 300** reverb, $3900. Berler Communications, 708-263-6400.

### Want To Buy



**Marti CLA-40,** working. FAX 816-263-2300.

## MICROPHONES

### Want To Sell

**EV 644** (50) shotguns, XLR, $100 ea; (100) EV 627 cardioids, XLR, $25 ea; ordinary dynamics, $15 ea. 212-969-0240.

**RCA 77DX** (2) & (1) 44BX vintage mics, exc cond, $500 ea. D Hedrick, WNUE, 118 Wright Pkwy, Ft Walton Bch FL 32548.

**EV 635,** excellent condition, $50/BO. J Diamond, Blue Diamond, Box 102C Chubbic Rd, Canonsburg PA 15317.412-746-3455.

**Sennheiser 421,** good condition, $195. G Erway, KKSB, 3450 SE Martinique Tr, Stuart FL 34997. 407-283-6871.

**Beyer Sportcaster** headset/mikesets, (2), DT109.4 w/batt pwr splys, $100 ea/$175 both. B Dixon, WAWC, 10129 N 800 E, Syracuse IN 46567. 219-457-8181.

**Lectrosonics Pro 4** quad pack that holds (4) CR 185 rcvrs w/common pwr sply & ant, new, $1250/BO. E Toline, 312-975-6598.

**B+K 2801** tube-type, power supply with conn & mains power cord, Best Offer/trade. J Roper, Imperial Sound, 383 N Studio St, Terre Haute IN 47803.

**Sennheiser 421,** gd cond, $250. G Gabriele, WFOG, 215 Brooke Ave, Norfolk VA 23510.

**EV RE-20,** exc cond, $300; (3) Shure SM58, avg cond, $70 ea/$200 all. J Somich, Somich Prods, 1208 Stoney Run Trail, Broadview Hts OH 44147. 216-546-0967.

**EV 676** supercardioid mics 3/$200; EV RE10 mic, $125. W Gunn, 619-320-0728.

**Telefunken tube mic** pre amps V-76, U-73 limiter's; RCA BA-21As, BA-1As; Altec tube mic-pres. Tracy Eaves, 615-821-6099 (evenings before 10PM EST).

**Telefunken M-250,** U-67, 221-A; Neumann U-67, KM-56, UM-57; RCA KV3A-10,0001, 44-BX, 77-DX, BK-4, BK-5, 74-B, varicustics; Altec M-20, M-11, M-30 tube type mics. Trade or sale. Tracy Eaves, 615-821-6099 (evenings before 10PM EST).

**Telefunken M921** dual (2-way, not front/back) nickel cpsules, cardoid only, classic tube mic; **Neumann KM84** pair, mint, $1100. W Gunn. 619-320-0728.

### Want To Buy

**Old/cool,** buy/sell/trade amps/spkrs. N Erickson, Rainbow Rcdg, 2322 S 64th Ave, Omaha NE 68106.

**RCA 77DX** nice cond, working cond w/mount. B Berry, Karavan Bdctg, 13 Montgomery Pl, Conroe TX 77284.

**RCA 77DXs/44BXs** ribbon, chrome/TV grey, gd cond, BO. R Kaufman, Pams Prods, POB 462247, Garland TX 75046. 214-271-7625, after 3PM CDT.

**77-DX's, 44-BX's, KU-3A's** On-Air lights. Top price paid. Fast respns. Bill Bryant Mgmt, 2601 Hillsboro Rd, G12, Nashville TN 37212. 615-269-6131.

## MISCELLANEOUS

### Want To Sell

1-6' rack; 6-7' racks; (3) R-R racks, BO; 24 VDC pwr sply. Mark, 308-382-2800.



**WE 189D** xformers, $35/pair; UTC LS-141 hybrid xformer, new, $50; UTC LS-33 20 W line:line xformers, $100/pair; Cinema Engrg 64266 xformers, $30/pair. R Robinson, TNA Rcdg, 10 George St, Wallingford CT 06492. 203-269-4465.

**Bardwell-McAlester** big stage lights, 2000 W fresnels w/clamps, barndoors, gd cond, $200 ea; Kleig 1000 W boards w/clamps, gd cond, $100 ea. 212-969-0240.

**Phase Master T7500,** very gd cond, low use, $1800. S Greeley, Mad Dog Wireless, 1845 McCulloch Blvd A14, Lake Havasu City AZ 86403. 602-855-1051.

**JBL D16-2405** rplcmnt diaphragm, new, BO/trade. J Roper, Imperial Sound, 383 N Studio St, Terre Haute IN 47803.

**Audio Dig Mdl TC-2** dig delay unit, new, w/o manual, $890 ppd UPS; (3) new, up timers, 2" readouts, $57.50 ppd; Sparta Elec misc audio & RF tech manuals; (3) Sparta TPA 7-1 25 W audio mods, $45 ea/$100 for 3; (8) Nortronics Sensor tape hds Mdl CH3-R, $10 ea/$50 for 8. D Peluso, KJUL, 2880 E Flamingo Rd #E, Las Vegas NV 89121. 702-732-2200.

**Subcarrier Pager** syst, Spantel dial access paying terminal & Zetron Mdl 55 voice storage unit w/15 pagers, $2500/BO. J Boswell, WKOZ, POB A, Kosciusko MS 39090. 601-289-1340.

**Bell telephones** (2) desk sets, tan, TT & 6 push buttons for 5 lines & hold, new w/cable & 50 conn, $50 ea/$85 both/BO. L Snyder, Madera Bdctg, Box 182, Floral Pk NY 11001. 718-347-2940.

**Teltronix TL-5** telephone info syst, 2 decks, like new, $150. C Ratliffe, WADE, POB 1210, Wadesboro NC 28170.

**Sharp XV-100** LCD proj w/screen, 100" pict, warranty, $2500. B Rico, Matrix Syst, 1056 Paula St, San Jose CA 95126.

### Want To Buy

**UTC LS-10X** & LS-18 xformers; schematic for West Electroacoustic Labs mic PS120A; Hycor 4201 passive EQ; manuals & schematics for Gates Sta-lvl M-5167 limiter, Gates M3529B limiter & CBS Decibel Meter Mdl 600. R Robinson, TNA Rcdg, 10 George St, Wallingford CT 06492. 203-269-4465.

**Spotmaster TP-1A** red clock displays mins & secs, analog. J Book, WOC, 3535 E Kimberly Rd, Davenport IA 52807.

**1950s 45/78 records,** studio rcdg equip, old radios, jukeboxes. K Gutzke, Custom Records, 7134 15th Ave S, Minneapolis MN 55423. 612-866-6183.

**Ed Noll's** Marine Radio-Telegraph operators license handbook. N Beardsley, 906-753-6930.

**Sangamo G1B** mica capacitor, .002 MFD, peak working voltage 60900, 11 amps at 1 kHz/equiv, 3 1/4" mounting. B Dickerson, WEAG, 1421 S Water St, Starke FL 32091.

**Bdct News** magazine, back issues from 40s-60s. B Mitchell, 84-39 153rd Ave #5C, Jamaica NY 11414. 718-738-9223.

**Radio transformers** by Chicago, UTC, Triad, Peerless, Freed, Sola, send list. J Gangwer, 942 32nd St, Richmond CA 94804. 415-644-2363.

**Jazz record collections,** 10" LP/12" LP be-bop, swing, dixie, highest prices paid. B Rose, Program Recdgs, 228 East 10th, NYNY 10003. 212-674-3060.

## MONITORS

### Want To Sell

**RCA WM 43A** mod; RCA WF-48A freq. J Munn, Oroville Radio, POB 1340, Oroville CA 95965. 916-533-3700.

**Belar AM RF** amp/mod mon, BO. Mark, 308-382-2800.

**Harris AM** stereo/mono mod monitor STM-1, excellent condition, $1000/Best Offer. L Robinson, WPAX, POB 129, Thomasville GA 31799. 912-226-1240.

### Want To Buy

**McMartin TG-2** EBS decoder. R Whitlock, KITE, 838 G Sidney Baker, Kerrville TX 78028. 210-792-4560.

**Any older McMartin** mod monitors. C Goodrich, 11435 Manderson, Omaha NE 68164. 402-493-1886.

## MOVIE PROD EQUIP

### Want To Sell

**Magnasync Moviola 3000** 16mm edge-trk rec w/inching knobs, 3 PB units, 16mm edge-track w/inching knobs & a B&H proj & counter w/large display & small unit w/display; (2) cntrl panels, 1 main, 1 mini, rack units, $15K. A Baker, Bdct Prods, 804 E 38th St, Indianapolis IN 46205. 317-925-7371.

**Pathe Prof Reflex 16** gd cond, BO. G Arion, GRA Assoc, 63-37 Wetherole St, Rego Pk NY 11374.

## RECEIVERS & TRANSCEIVERS

### Want To Sell

**Hammarlund HQ 140 X** all-band comm, nds work, looks gd, BO. T Spencer, WODY, Rt 1 Box 224, Bassett VA 24055.



**McMartin FM** for EBS, $100; Gorman Redlich EBS encoder/decoder, $100. M Mayhugh, 304-485-7354.

**Moseley TRC-15** 15-channel with Hallikainen dig retrofit, $600. J Morris, WLYF, 20450 NW 2nd Ave, Miami FL 33169.

**Gentner SPH4** hybrid, gd cond, $300. G Gabriele, WFOG, 215 Brooke Ave, Norfolk VA 23510.

**Moseley WRC 25** with remote control, tube type, good condition, $200. D Rose, KAAA, 2534 Hualapai Mtn Rd, Kingman AZ 86401. 602-753-2537.

**Gentner EFT-3000** (4) 3-line dig freq extenders, gd cond, $5500 ea/BO. T Portzline, Bdct Equities, 1000 Centerville Tpke SHB-213, VA Bch VA 23463. 804-523-7695.

**Marti RMC 15S** xmtr rem ctrl w/manual, $450. R Chambers, KSUE, 3015 Johnstonville Rd, Susanville CA 96130. 916-257-2121.

### Want To Buy



**Motorola Starplex** modems & term cards; MUX shelves & 2 GHz ants. J Vine, Vine Comms, 2845 Airway Ave, Kingman AZ 86401.



**Motorola Pageboy II** UHF, 15 voice papers, fair cond w/tone filters, working, trade 1/2", working, $325. Sean, Sabrina Co, POB 467, Mercer Isl WA 98040. 206-298-9030.

**TFT 760** EBS tone gener, decoder, AM rcvr, $300. T McNally, WMID, 1825 Murray Ave, Atlantic City NJ 08401. 609-344-0300.

**Sony STJ-75** FM tuner, 8 push buttons, seek/scan, 75 ohm coax & 300 ohm twinlead input, new cond, $175/BO. L Snyder, Madera Bdctg, Box 182, Floral Pk NY 11001. 718-347-2940.

**McIntosh MR77,** beautiful, $475. G Gabriele, WFOG, 215 Brooke Ave, Norfolk VA 23510.

### Want To Buy

**Avcom SCPC-200E** rcvr. J Coursolle, 414-236-4242.

## REMOTE & MICROWAVE EQUIP

### Want To Sell

**Mark 96GRN,** 8' grid dishes (2), with feedhorns and stiff arms, BO. Call 314-687-3932.

**Moseley PCL-303/C** STL xmtrs, 951 MHz, $300; 948 MHz, $300; (2) STL rcvrs, 948 MHz, $300 ea; STL rcvr, 950.5 MHz, $300; PBR-15A rem ctrl, parts only, $50; (2) TPR-1 STL rcvr xfer panels, $75 ea. D Vernier, KUNI, Univ No IA, Cedar Falls IA 50614. 319-273-6400.



**Moseley TRC15A,** $700. K Smith. WNCG, Box 66, Clyde OH 43410. 419-547-8792.

**Moseley TRC-15AW** 15-chnl, analog, fair cond, BO. T Alexander, WDOK, 1 Radio Ln, Cleveland OH 44114. 216-696-0123.



**Marti RMC-15** 16-chnl, exc cond, 3 pieces w/manual, $500. D Igou, 8435 Twisted Oaks, Garden Ridge TX 78266.

**Moseley PBR-21** manual. N Beardsley, 906-753-6930.

## SATELLITE EQUIPMENT

### Want To Sell

**Zephreus 300,** new, excellent condition, $750. K Diebel, KTJC, 1207 1/2 Louisa, Rayville LA 71269.

**Zephreus 300 Series** with 3-frequency tone decoder. K Diebel, KTJC, 1207 Louisa, Rayville LA 71269. 318-728-5852.

**STS** consumer units, stereo audio, matching positioners, $50 ea. G Gabriele, WFOG, 215 Brooke Ave, Norfolk VA 23510.

**Wegener SCPC** receiver with 601 mainframe & with 1 each 1608-22, 1689-05, 1610, 1610-01, 1646 & 1601 cards, Best Offer. J Coursolle, 414-236-4242.

**SCPC SATELLITE AUDIO RECEIVE EQUIPMENT:** New & used, many brands, complete units, downconverters, commercial **LNB's.** All in excellent condition, good prices, perfect for low cost SCPC uses. SASE for list. Universal Electronics, 4545 Groves Rd #13, Columbus OH 43232. 1-800-241-8171.

### Want To Buy

**Ku-band TV** exciter, working. 212-969-0240.

## STATIONS

### Want To Sell

**AM** in Yazoo City MS, dark, $30K; 25 kW-CP in Susanville CA, $25K; 25 kW-CP in Laramie, WI, $25K. D Ganske, Hawkeye Radio, 5546-3 Century Ave, Middleton WI 53562. 608-831-8708.

**Broadcast facility** for talk/news/music, late, high qual equipment, 14' x 30', 2-axle mobile studio, less than 5 yrs old w/ac & restroom. 503-774-0459.

**50 kW AM in Capital City,** clear chnl, mid/low dial pos, unltd time non dir, days dir, nights, sale/lease. 501-470-1525.



**AM** on Calif S coast, 161 mkt, fully auto, unique oper, new equip, $395K. G Erway, KKSB, 3450 SE Martinique Tr, Stuart FL 34997. 407-283-6871.

**3 & 5 kW FMs** fully equipped in small community outside Richmond/St Petersburg VA, FM can go to 6 kW now, possible C3 upgrade/equity pos. D Royer, 919-527-2955.

**Major San Fran CA FM** has subcarriers available, broker participation encouraged. J Jacob/D Evans, 415-695-5740.

**FM Station in North Italy,** 15km from Milan & 20 from Suisse, 3 frequencies: 92.450/91.800/93.600. $480,000US$. Radio Serena, R.S.33 s.a.s., Via Genova 28, Busto Arsizio (VA) 21052 Italy.

### Want To Buy

**FM or combo, Western states.** FT or FT/AM and other areas considered if price is right. Cash or terms, depending on market size. Call D. Crepps/IBS, 805-294-9441 or fax info to: 805-294-9442.

## SWITCHERS (VIDEO)

### Want To Sell

**Alta Pyxis 5.5** (2) TBC/synch, 4 inputs, S-video, 3/4" dub, comp, DS keyer, dig eff, GPI & serial, color bars, borders, $9300. R Millman, MW, 550 W 43rd St, NY NY 10036.

**SMC DS-20** 20-event, manual & automatic for DP-2, $500. P Swint, KIXQ, 2620 Dogwood Rd, Joplin MO 64801.

## TAPES/CARTS & REELS

### Want To Sell

**AC/Oldies** library on Fidelipac grey carts, approx 750, $800. T Mohr, WCLS, POB 296, Oscoda MI 48750. 517-739-8180.

**10" C&W** (75), gd cond, BO. A Terry, WODY, Box 545, Bassett VA 24055. 703-629-2509.

**(75) 10 1/2",** plastic, used once, $500+s/h. T Crockett, Hot Tracks, POB 10501, Blacksburg VA 24062. 703-953-0222.

**Record collection** of (5100) 45's, (500) LP's, all mint/good condition, Best Offer over $3000. D Hedrick, WNUE, 118 Wright Pkwy, Ft Walton Bch FL 32548.

**Airchecks** of current AM as rcvd on qual equip at this location. J Douglas, Orig Oldies, 402 Shirley Rd, Seaford VA 23696. 804-898-6836.


**Various 14",** metal, some with tape, gd cond, BO. G Gabriele, WFOG, 215 Brooke Ave, Norfolk VA 23510.

**3M 931 10",** high output, low noise, exc cond; 10" empty; Scotch cart shells. R Taylor, WHEN, 620 Old Liverpool Rd, Liverpool NY 13088.

**Ampex 456,** new, blank, 1/4" on 10 1/2" reels w/boxes. Forest, Musical Starstreams, POB 1989, Seoona AZ 86336. 602-204-1989.

**Pams Jingles** ref tapes, 1951-1976, BO. R Kaufman, Pams Prods, POB 462247, Garland TX 75046. 214-271-7625

**Owner must liquidate** thousands of brdcst qual music carts, 3.5, 5.5 & 7.5 min lngths. $1 & up. C Casarez, 707-445-8104.

**3M 1/4",** (50) on 10" reels in boxes, most new w/light use, $8 ea/BO; (10) Agfa PEM 468 mast tape, 10" hubs only, no reels, new, $60; (70) 4A Audiopak, various lengths 40sec-4min, gd cond, $1.75 ea/BO; (10) Agfa PEM 469 mast tape, 10" hubs, no reels, new, $60; assortd carts, various cond, .50-$2 ea. L Snyder, Madera Brdcstg, Box 182, Floral Pk NY 11001. 718-347-2940.

**Bonneville lite/AC** library, pristine cond, 101+ disks, $2500. T Backer, WXHC, Box 386, Homer NY 13077. 607-749-9942.

### Want To Buy

**We pay 50 cents** to $100 per record for 45's & LP's from 50's & 60's, nice cond only, rock/country/blues. B Berry, Karavan Bdctg, 13 Montgomery Pl, Conroe TX 77284.

**Tascam 32/34** Mdls RTS-14/15. S Keefe, WCNI, CT College, New London CT 06320. 203-447-1296.

**CDs/DATs/tapes** of rock & folk artists, 70s/80s/90s, trade/cash. R Barth, 3113 Ivy Chase Way, Atlanta GA 30342.

## TAX DEDUCT EQUIP

### Want To Sell

**Bdct training school** for underprivileged nds R-R R/P, 8-chnl stereo console, will send rcpt & pay s/h. F Smith, 615-624-7126.

**5 kW & FM xmtr**/ant/studio equip for non prof Christian radio/Rep of Armenia, will pay s/h. S Lazarian, Essco Armenia, c/o 2645 Nina St, Pasadena CA 91107. 818-795-8641.

**Equip/cameras** for Chrisitan cable prod. J Chapman, JC Sound, 402 E Front, Monroe MI 48161.

**SC mass choir** desires old bdct equip, in repairable cond, will pay s/h, for new non-comm FM. C Washington, 803-223-2823.

**Eng student** desiring donation of old bdct equip (anything)in repairable cond, will pay all shipping charges, EE student at Purdue. C Gill, POB 371, Indianapolis IN 46206. 317-923-2800.

**Monte Vista Christian School,** would appreciate any donations of used radio equip along with used TV broadcast equip. T Quinn, 408-475-0423.

**Low-pwr educ AM/FM** nds xmtr, will pay s/h. N Rickly, SMH Schl, POB 11425, Trenton NJ 08620.

## TEST EQUIPMENT

### Want To Sell

**RF signal gener** URM-26B, 4-405 MHz, GC, $80. K O'Malley, WLTY, 4416 Mallard Crescent, Portsmouth VA 23703. 804-446-2731.

**Elcom 300** freq counter with 5 & 10 MHz WWV receiver, manuals, excellent condition, $325. G Heidenfelot, 716-751-6187.

**Helper Instr Mdl SM-1000** svc mon/SINAD mtr, built-in tone gener, output to 100 W with carry case, batt pack & access, 1 1/2 years old, little use, $3000. B Moore, KIRK, POB 1112, Lebanon MO 65536. 417-532-9111.

**Eico** tube & transistor tester, signal tracer & generator, Best Offer. T Spencer, WODY, Rt 1 Box 224, Bassett VA 24055.



**Boonton Q-Meter** 160-A coil analyzer, good condition with manual & spare tube, $45 + s/h. R Kramer, Kramer Stereo Service, 919 Grove St, Aurora IL 60505. 708-898-4044.

**Potomac AG-51** audio generator; AA-51 audio analyzer, including carrying cases & manuals. Like new. Call 800-724-9479.

## TRANSMITTERS

### Want To Sell

**RCA AM** (2)/1000 W BT1K & 250 W BT250L. J Munn, Oroville Radio, POB 1340, Oroville CA 95965. 916-533-3700.



**TTC XLFM** xlator w/(2) TVK-1 code ID bds, (2) mod bds for spot injection, $200 ea. D Rose, KAAA, 2534 Hualapai Mtn Rd, Kingman AZ 86401. 602-753-2537.

**Collins AM 550-A**, gd cond, 250/500 W. A Terry, WODY, Box 545, Bassett VA 24055. 703-629-2509.



**ITA FM 10000 C**, rebuilt, new finish driver & sockets with spares, available 1/10/93, $13K with exciter, $12K with out. T Mohr, WCLS, POB 296, Oscoda MI 48750. 517-739-8180.

**RCA 50H**, 50K W, gd cond, BO; RCA BTA-10H, 10K W AM, gd cond, Best Offer. C Stone, 804-685-2924.

**Gates FM 10-G** tuned to 99.1 MHz. New final & driver tubes, gd cond, priced to sell. Larry or Dave, KMEN/KGGI, 2001 Iowa Ave #200, Riverside CA 92507. 909-684-1991.

**RCA BTE-15A** w/2 SCA geners, ext bd & book. 503-774-0459.

**Harris** SAW filter bd, $550; Townsend UHF exciter, $10K; Townsend Pulser ICPM corr chassis, dual output, $12200; Harris Visual & LO for aural, UHF, $5K; Townsend exciter parts. G Kenny, KCL, POB 932, Neosho MO 64850. 417-451-1440.

**Energy Onix** 3.5 kW FM, 2 1/2 yrs old, $13500. R Chambers, KSUE, 3015 Johnstonville Rd, Susanville CA 96130. 916-257-2121.



**Continental 814-C** 3.8 kW solid state, FM w/o exciter, exc cond. S Woodward, WMTY, POB 459, Greenwood SC 29648.

## ACTION-GRAM

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**TRANSMITTERS...WTS**

**CCA FM 40** E 40 W exciter w/manual & test cable, $1900; McMartin B-910 exciter, $1000, w/stereo & 57 kHz gen-ers, $1600. M Benson, KWTY, Box 773, Big Pine CA 93513.

**Gates M-6095** exciter, needs crystal for 91.3 MHz with or with out oven. N Beardsley, 906-753-6930.

**10 W AM**, prefer 1610 AM/tunable. A Anello, 813-933-6009

**FM TRANSMITTERS**

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| 2.5 kW | FM | 1977 | Collins | 831-D1 |
| 8.0 kW | FM | 1979 | CCA | 8000E |
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**RCA BTA-500 MX** AM, gd cond w/Kintronics low pwr, $500; Collins 21E 5 kW AM, exc cond, $1000. Steve, WPRZ, POB 3220, Warrenton VA 22186.

**Cinema Radio Corp SS-10A** svc info, will pay. D Jones, WRCC, 2052 Watson Blvd, Warmer Robin GA 31093. 912-922-2222.

**NEW** BROADCAST ELECTRONICS, INC.'s Solid State FM 1KW with FX-50 only $16,500, 500 watt also available.

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**Collins 830F** 10 kW, gd cond with new 250 W exciter, BO. J Rodriguez, Alcatraz FM, Sol 60 Santiago, Dominian Republic. 583-8883.

**McMartin AM/FM xmtr,** any model, exciter or stereo modules. Goodrich Ent., 11435 Manderson, Omaha NE 68164. 402-493-1886.

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## TUBES

### Want To Sell

**NEW EIMAC TUBES**
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**6118 PA** for TTU-1 RCA TV xmtr, new, unused, cash/trade. L Nixon, Classic City, 1094 Baxter St, Athens GA 30606. 706-613-6724.

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**872-A** (2), $49; (5) 810, $190; (4) 828, $150; (2) 866A, $30; 833A. $175; 802, $35. J Munn, Oroville Radio, POB 1340, Oroville CA 95965. 916-533-3700.

### Want To Buy

**TTC XLFM-10** 10 W; modulator & IDer bds. J Vine, Vine Comms, 2845 Airway Ave, Kingman AZ 86401.

**Tepco/Jones J317** single/dual 10 W output translator. J Stromquist, WNCB, 2828 Piedmont Ave, Duluth MN 55811.

**CCA 10/12** kW single-phase FM, rempte control; STL with dish(es). M Grubbs, KATG, POB 1047, Luling TX 78648. 210-875-2555.

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### Want To Buy

**6076,** state cond, glass/ceramic. M Hanson, KYTC, 308 N 11th St, Northwood IA 50459. 515-324-1172.

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## TURNTABLES

### Want To Sell

**Technics SL1200MK**II w/tonearm & cart, used 10 hrs, $475+s/h. B Dixon, WAWC, 10129 N 800 E, Syracuse IN 46567. 219-457-8181.

**Russco Cue Master** (2) 12", gd cond, $100 ea. M Mayhugh, 304-485-7354.

**QRK** (2); Rek-o-kut w/mixer, BO. Mark, 308-382-2800.

**Thorens TD124** classic w/o arm, gd cond, $200. G Gabriele, WFOG, 215 Brooke Ave, Norfolk VA 23510.

### Want To Buy

**1950s studio rec** equip, hi-fi tube gear, 45/78 records. K Gutzke, Custom Records, 7134 15th Ave S, Minneapolis MN 55423. 612-866-6183.

**Moving coil** cart phono preamp, pref 0.09 mV in/3.0 mV out. D Price, Audio Prod, 310 N Howard St #103, Alexandria VA 22304. 703-751-9346.

## VIDEO PROD EQUIP

### Want To Sell

**Sony RM-400** U-Matic edit ctrl unit w/both cables, gd cond, $150+s/h; Pana WV-600P spec FX gener, wipes, switches, dissolves, gd cond, $75+s/h. G Kirby, Gray Fox Video, 13613 US 36, Marysville OH 43040. 614-261-8871.

**Sony AC-2400** & AC-3400 pwr splys, new, BO/trade. J. Roper, Imperial Sound, 383 N Studio St., Terre Haute IN 47803

## VIDEO TAPE RECORDERS

**Ampex Model VR8075** video recorders (2), walnut cases. Trade for ROLEX or make offer. Jack at 210-651-6864.

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Circle (32) On Reader Service Card


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