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See pp. 25-38

Vol 19, No 24 | Radio's Best Read Newspaper | November 29, 1995

Proponents Create DAB Delays for U.S.

by Lynn Meadows

WASHINGTON With Canada on the verge of issuing its first licenses for digital radio stations, the United States remains mired in testing the various digital audio broadcasting (DAB) systems.

The DAB field tests — which were scheduled to be in their final stages by now — have been delayed until February. And a second round of field tests are to follow in May 1996.

A U.S. DAB standard is unlikely to be named until all the tests are completed.

The Electronic Industries Association (EIA) and the National Association of Broadcasters (NAB) are cosponsoring the quest for a DAB standard. But the EIA has its hands full answering lingering questions following the DAB lab tests and mollifying proponents angry that Eureka-147 will use a second transmitter for the San Francisco field tests.

The Eureka-147 DAB system caused part of the original delay in the DAB field tests. The Eureka system, which is used in Europe and Canada, can function anywhere from 30 MHz to 3 GHz. But the system Eureka submitted for the U.S. tests must operate in the L-band (390 to 1550 MHz).

As L-band is used for aeronautical telemetry in the United States, the EIA spent the summer negotiating with the National Telecommunications Information Administration (NTIA) to somehow share the spectrum for the field tests.

Unlikely scenario

Although the two have agreed to terms for the tests, it is unlikely that the Eureka system will ever be adopted for use in the L-band in the United States.

Still, Clink Pinkham, manager of technology applications for Thomson Consumer Electronics Inc., one of the Eureka partners, is optimistic.

"I'm reasonably confident that the Eureka system will be adopted in the U.S. at some point in time," he said.

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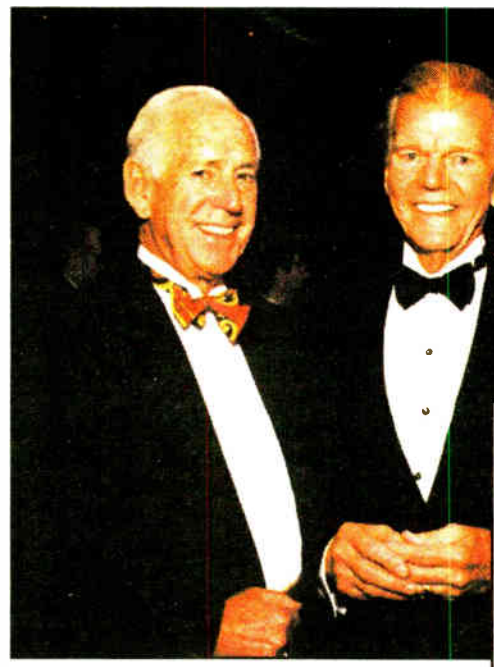

Jack Buck and Paul Harvey (right) and Casey Kasem (below)

CHICAGO Seventy-five years of radio history filled the airwaves on Oct. 29, as the Radio Hall of Fame celebrated radio's birthday with a live broadcast of its 1995 induction ceremony.

The fourth broadcast honored these 1995 Radio Hall of Fame Inductees: Jesse B. Blayton Sr.; Andrew Carter; Edward Pate Jr.; Eve Arden; "One Man's Family"; Yvonne Daniels; Stan Freberg; Les Tremayne; Hal Jackson; Jack Buck; "The CBS News World Roundup"; Bob Steele; Edward F. McLaughlin, and Arthur C. Nielsen Jr.

Look for complete coverage in the next issue of **RW**.

WPAT-AM-FM Sold in 'Mega' Deal

by Frank Beacham

NEW YORK The creation of new FM and AM duopolies by two of the nation's top Spanish-language broadcasting groups underscores the explosive growth here of Hispanic radio in less than five years.

Mid-February is the target date when WPAT-FM begins a new Hispanic format for The Spanish Broadcasting System (SBS) and WPAT(AM) begins a new life for Heftel Broadcasting Corp. The stations were sold in November by Park Communications for a total $103 million.

The transaction brings the second mega FM duopoly to New York City. The first was Emmis Broadcasting with FM ratings powerhouses WQHT and WRKS.

Though the new owners have yet to announce their formats, the station purchases mean a certain expansion of Hispanic programming in a New York market that

continued on page 6 ▶

Circle (35) On Reader Service Card

INTERNATIONAL UPDATE

Canada DAB On Track

by James Careless

OTTAWA Canada can begin issuing digital audio radio licenses, effective immediately.

It is official: the Canadian Radio-Television and Telecommunications Commission (CRTC) has given the green light to issuing digital radio licenses in Canada.

In a policy paper released Oct. 29, 1995, which coincided with the appearance of Commission Chair Keith Spicer at the 1995 Canadian Association of Broadcasters' (CAB) Convention in Ottawa, the CRTC stated that, "With the expected adoption of the Eureka

continued on page 8 ▶

World Radio History

NEWSWATCH

Group Owner Convicted of Felonies; FCC to Investigate

TERRE HAUTE, Ind. Michael Rice was convicted last year of 12 felony counts of sodomy, sexual abuse, and sexual assault of five children ranging in age from 12 to 16.

Last month, the Federal Communications Commission told the companies of which Rice is president, treasurer, director, and part owner, to prepare for a revocation hearing and explain why their licenses and construction permits for seven midwest radio stations should not be revoked.

Rice is 100 percent owner of Contemporary Media Inc. (CMI) and Contemporary Broadcasting Inc. (CBI). He owns 67.5 percent of Lake Broadcasting Inc. (LBI).

WBOW(AM), WBFX(AM), and WZZQ-(FM) in Terre Haute, Ind.; KFMZ-(FM) in Columbia, Mo.; KAAM-FM in Huntsville, Mo.; KBMX-(FM) in Eldon Mo.; and KFXE-(FM) in Cuba, Mo., are licensed to Rice's companies.

The commission said it is looking for answers to several questions in the revocation hearing. First, it wants to know if Rice's convictions affect the basic qualifications of the three companies to hold radio licenses. It wants to find out if the licensees lied about Rice being excluded from the management and operation of the radio stations after the conviction.

If Rice was excluded from the operation of the stations, the FCC will then determine if he engaged in an unauthorized transfer of the stations. Last, after all the evidence is brought forward, the commission will determine if CMI, CBI, and LBI are qualified to remain licensees of their respective radio stations.

In the event that an order revoking the licenses of the three companies is not issued, the commission will consider whether a forfeiture should be issued. The amount of that penalty could total $250,000.

Sources at the FCC said the hearing probably will not take place before the end of the year. The most recent license revocations were for drug convictions.

When looking for a digital audio system for automation of satellite programing or live assist, there would appear to be many choices. But if you're looking for a system which is flexible enough to give you total control without sacrificing your sanity, there is only one choice. The Phantom by RDS.

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World Radio History

KBOI(AM) Signal Riding the Rails

by Bob Rusk

BOISE, Idaho Can AM radio signals reach farther by hopping a ride on railroad tracks? Bill Frahm, longtime chief engineer at KBOI(AM) on 670 kHz, says "yes." A careful study of his coverage map, showing huge bumps in the pattern, makes it difficult to disagree.

The tracks act as a ground plain, he theorizes, working in much the same way as radials running from a tower. Frahm first noticed this phenomenon in 1981, while taking signal measurements for KBOI.

"The theoretical signal looked almost round, except for some reduction over the mountains to the northeast," he said.

"When we did measurements toward Twin Falls to file against a station that was going to go on 650, we noticed that the signal down there was more than it should have been.

"The two millivolt was supposed to be around 65 miles and it ended up being around 134 miles. South of Twin Falls on another radial, the two millivolt signal was at 95 miles, instead of 72. The shape of the Treasure Valley could have some effect on it. I use the railroad tracks as the only other explanation I can think of."

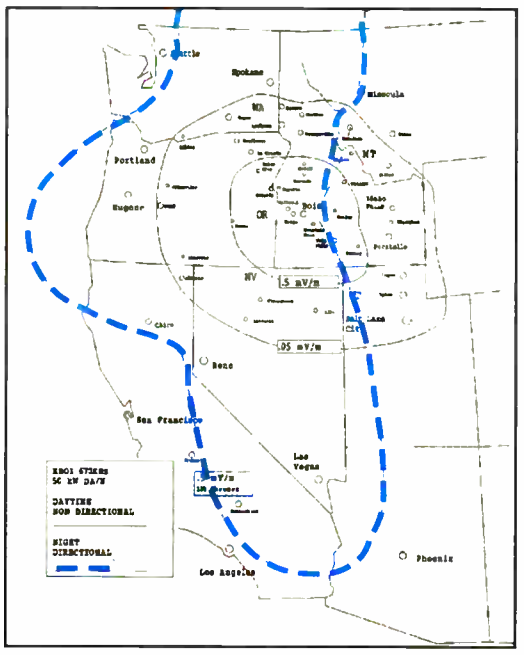
A 121-degree radial in the direction of Twin Falls parallels the track for some 50 miles, crossing the tracks in some areas. Frahm has noticed that "when you drive along the tracks, the signal goes up and down, then up again. It's like the effect you get when you drive near power lines. The station fades in and out.

"Close in to the transmitter site, the tracks don't seem to have much of an impact," he continues. "But as you get 10 - 30 miles out, the ground conductivity seems to go way up. Where the line parallels the tracks, the ground conductivity measures around 30 instead of the predicted eight.

"When it leaves the tracks, the conductivity drops to about 15 — but that's still way up there." The signal does not appear to be helped by the nearby Snake River.

KBOI, at 50 kW, has a four-tower nighttime array and uses one stick for its nondirectional daytime pattern. The towers are about a mile-and-a-half south of the tracks, in the high desert.

Frahm has discussed his discovery with engineers at a NAB convention and they agreed that the tracks are likely responsible for KBOI's ultra-strong signal to the northwest and southeast of Boise.



KBOI's coverage area

In the late 1970s, an engineer contacted Frahm after picking up KBOI loud and clear in Ogden, Utah, 250 miles to the southeast.

"He was out taking measurements for a station down there and took some for KBOI and sent them to us," recalls Frahm. "He thought it was quite interesting that we had such a strong signal at that location."

KBOI puts a good signal into much of Utah during the day, but at night it's difficult to hear the station there, because of an 85 degree null to the east that protects WMAQ in Chicago. KBOI also has nulls to the northwest and southwest. "Our null to the northwest is a lot less than we thought it would be," Frahm says. "The null to the southwest is close to the predicted."

The KBOI transmitter site is about 12 miles south/southwest of the downtown studios, on a 40 acre desert site inside the Birds of Prey Wildlife Refuge. Frahm also suspects that underground pipelines running south of the tracks might have an impact on the station's signal.

Being close to tracks apparently does not guarantee a stronger signal, however. KGHL(AM) on 790 kHz in Billings, Mont., has two towers located about 400 yards from the rail line.

"I have not seen a reflection of that in any of my pattern measurements," says KGHL chief engineer Charles Dozier, who has been at the station for five years. "Every time we've done a proof, it comes out exactly the way it's supposed to.

"I have records of all the proofs that were done before I came here and none of them point to any benefit from the railroad tracks."

Dozier adds that the KGHL transmitter site is "closer to the Yellowstone River than the tracks and the river provides an excellent ground for us."

But he does agree that the tracks could enhance a station's signal strength.

"If you take a look at it," he explains, "they probably would provide a good ground plain if you were close enough to them. It would probably depend on where the tracks were grounded and whether or not you were part of that ground."

Patrick Martin of the International Radio Club of America (an organization that monitors the strength of AM signals) first noticed KBOI's powerful signal years ago. From his listening post on the Oregon coast, 400 miles northwest of Boise, Martin can hear KBOI all day.

"I'm not in their coverage area. KBOI's signal has to come over three mountain ranges to reach me," says Martin. "As an experiment, I installed a 1,500-foot longwire with a 1,500-foot radial running directly below it. Both are terminated to a series of ground rods in a saltwater swamp.

"With this system, KBOI is the strongest station I hear from Boise," he adds. "It's as strong as some of the stations from Portland, which is about 100 miles southeast of me." Martin hears KBOI on a Drake R8 Communications Receiver. He has been monitoring the AM band for over 30 years and strongly believes railroad tracks can increase a station's coverage area.

"You can lay a portable radio next to tracks and the station in the direction of the tracks will get stronger," says Martin. With KBOI's enhanced coverage area, Frahm now finds himself in an enviable position. Most of the time when stations have questions about signal strength, it's because the pattern is weak.

"It's a supposition on my part that the railroad tracks enhance the signal, but according to the measurements it seems to be following the tracks," Frahm says. "So if you're going to put a radio station next to railroad tracks, you can expect almost anything."

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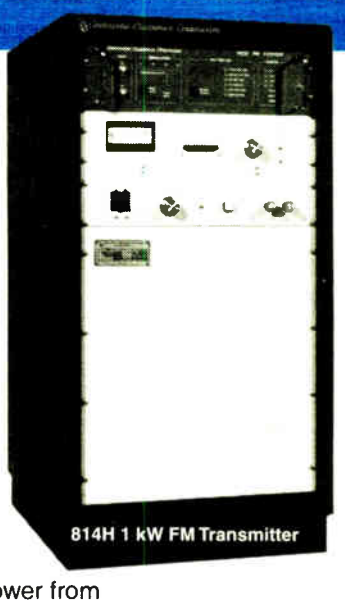
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World Radio History

Radio's Processes: Then and Now

WASHINGTON As if we weren't far enough behind on rolling out DAB in this country, proponents petitioned for and received the right to modify their systems for the field portion of the lab tests in San Francisco. So instead of wrapping up the year with an end to the process — and a recommendation to the FCC — in sight, the DAB selection process is further delayed by at least another eight months.

I understand where proponents are coming from: Eureka-147 was granted the right to add transmitters to its San Francisco system, so why shouldn't everyone else enhance their prototypes? My question is, "Why has it gotten this far?" Eureka-147 at L-band, regardless of its technical merit, is a moot point in the United States. Why are we delaying a DAB recommendation to allow them to test their system in San Francisco when they aren't even a player in this country?

Look around people. Pilot DAB projects are in place in countries around the globe — including Poland. And we're still placating entities that aren't likely to be selected as the system of choice in this country. It cannot be. L-band is not available for digital audio broadcasting.

The National Association of Broadcasters should've set its foot down and insisted on no further delays. After all, if indeed in-band, on-channel is the NAB's preference (so as to protect its many broadcaster members) then why is it being so quiet on this matter? As the front page story of this issue indicates, Canada is starting to issue licenses for DAB effective immediately. I understand the importance of diligence and ensuring equal treatment for all — but it needs to be tempered with forward movement. The world is moving past us and we are not doing a great job of moving forward at all. Come on NAB, nudge the process along, will you?

★ ★ ★

In all this DAB back and forth, sometimes it is hard to focus on the day-to-day success stories of the industry. I am happy to report that despite a still somewhat bumpy economy, the broadcast industry continues to hold its own.

Specifically, I just heard from Crouse-Kimzey of Annapolis. Kathleen Karas reports the company has moved to new, larger offices.

"FM sales continue strong," said Kathleen. "AM and overseas sales are growing."

Voice telephone for Crouse-Kimzey remains 800-955-6800. The fax number is now: 410-754-9999. Good luck in your new locale.

★ ★ ★

Radio is certainly the pioneer medium. As such, sometimes it seems to get less respect than it deserves from the subsequent "radio-with-pictures" type media. Not any more. One of cables most popular channels is paying tribute to radio's heyday.

American Movie Classics, the cable channel dedicated to the Golden Age of Hollywood is bringing the Golden Age of Radio to television with its first original live action series, "Remember WENN."

Scheduled to premiere on Jan. 13, 1996, (the 86th anniversary of Lee de Forest's first public broadcast in New York City), "Remember WENN," is a 10-part series that focuses on a group of actors, actresses, technicians and producers at radio station WENN.

The story lines cover both their on- and off-air adventures and will portray many of the early radio program types, including soap operas, science fiction, drama, mystery, news and children's programming.

American Movie Classics is pulling out all the stops for this production. "Remember WENN" is written by Tony award-winning author and composer Rupert Holmes ("The Mystery of Edwin Drood," "Escape, the Pina Colada Song"). Holmes also created the period music for the series. Emmy and CableACE award-winners Howard Meltzer and Frank Doelger, founders of the Entertainment Group/Turtleback Production will produce the series.

AMC's production strives for realism in every aspect, down to the speech elements on the air — keeping in mind that radio hosts of the 1930s prepared their dialogues meticulously. Let's face it, the on-air freedom enjoyed by the Howard Sterns and Don Imuses of today was unheard of before. Generally, lines of courteous speech were fairly well-defined and radio personalities respected them.

Other elements that pay tribute to that era include the art of foley (the creation of sound effects) with a character dedicated to just that was written into the script. Camera work is good, with close-ups of the actor as he recreates the different sounds and the split-second timing needed for enjoyable live broadcasts.

Also featured is the element of sponsorship. As you all know, advertisers patroned radio programs that always included "a word from our sponsor." The struggle for program content control between sponsors and the stations is dealt with (in fact an entire episode is dedicated to it).

Top row (l to r): George Hall (Eldridge), Melinda Mullins (Hillary), John Bedford Lloyd (Victor), Amanda Naughton (Betty). Bottom row (l to r): Chris Murney (Mackie), Dina Spybey (Celia) and Hugh O'Gorman (Jeffrey).

Holmes created original products and programs for them to sponsor, including Dutch Uncle Cocoa (the competition's sponsor); Acton Anthracite Coal - Rance Shiloh" show; Ingram's Coffee - "Breakfast at Bedside Manor"; Cup O'Comfort - "It's Your Nickel" radio talk show and Glint (dishwashing soap). All complete with jingles and distinctive radio announcers to accompany each message.

AMC shot the series on film and then manipulated it to emulate the Technicolor process which was prevalent in movies of the 1930s. Take a look — I thoroughly enjoyed the sneak preview I received. It is a nice homage from cable.

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READERS FORUM

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Two sides

Dear **RW**,

This letter is in response to comments that appeared in the Aug. 9 issue of **RW** concerning my guest commentary "Closer Look at Tower Regulation" (**RW**, June 14) which discussed 47CFR22.371, the regulation requiring tower proponents (especially Public Mobile) to protect the radiation pattern(s) of nearby standard broadcast stations.

There are two sides to every issue. Mr. Bixby's letter (Aug. 9) raised several points that require clarification.

1. AM Station's Insistence to Use Engineer of Their Choice: Any reputable consulting engineer knows how to avoid or minimize the potential for a conflict of interest. The AM station has the right to demand that its consulting engineer make adjustments to the station's phasing or coupling equipment. On the other hand, the AM station has the right to request that its engineer handle or assist with the simple field measurements. The field measurement matter boils down to the issue of "informed consent" where the scope of work done by the engineer and the professional fees paid to the engineer for the service would be settled in advance by both the AM station management and the tower proponent. Otherwise, without clearance by both parties, a conflict is inevitable. I believe that Mr. Bixby would insist on working directly with clear-channel clients represented by his employer if towers are proposed near those facilities.

2. FCC Standards for Tower Proponents: Mr. Bixby's article suggests that the new regulation (47CFR22.371) implies that the measurement requirements for proponents of towers near standard AM broadcast facilities are held to measurement standards weaker than those of section 73.154.

My response to that simply is that an individual of Mr. Bixby's stature certainly knows what the FCC rules are concerning modification of AM broadcast facilities and the 1989 policy statement issued by the FCC. The FCC requires new and modified AM, FM, TV, and auxiliary broadcast services' facilities located near standard broadcast antennas to make measurements on the affected AM station using section 73.154 as a standard (partial proof before and after construction/modification of facilities in the vicinity of the AM station). The 1989 policy statement extended the similar requirement to common carrier and other FCC regulated services and is supported by case law.

Unfortunately, the FCC's common carrier staff (which knows nothing about AM or broadcast operations) recently rewrote the cellular rules in Common Carrier Docket 94-201. The rewrite of the FCC's 1989 policy statement into a condensed regulation (Section 22.371) isn't worth the paper it is printed on and certainly not worth the taxpayers' money expended in writing it. Section 22.371 is an egregious example of poor, vague regulation that contains no minimum standard or reference to standards acknowledged in the policy statement. The rewrite of the 1989 policy statement aggravated the problem and as a result, a number of abbreviated filings have landed in the FCC. I assume that the FCC staff will ultimately reject as unacceptable a substantial number of the 22.371 filings and release some type of clarification notice concerning Section 22.371. A case in point involves a tower built near an AM station in Black Mountain, N.C.

3. Computer Models: A computer model (NEC or MININEC) is simply a tool ("predictor" in Mr. Bixby's response) and not a replacement for measurements. I recommend that any AM broadcaster affected by proposed nearby tower construction insist on measurements in lieu of computer models. Contrary to other assertions, a computer model depends on the validity of input data and even so, may not be representative of actual conditions due to other nearby re-radiating structures. There is no reason for an AM licensee to play computer generated "roulette" with the AM station when re-radiation is involved.

4. New Towers Should be Located in Directional Nulls: Granted, most responsible tower proponents will take precautions to locate a proposed structure in a null of the AM station's radiation pattern to minimize incident field (illumination) on the structure and subsequent reradiation. This is not always possible because cell spacing and other conditions may not always allow the proposed tower to be located in a null of the AM station's pattern. This is not possible with non-directional AM stations.

5. AM Broadcaster, Protect Yourself: I suggest that AM station licensees reread the June 14 guest commentary and take the time to evaluate any nearby proposed tower construction near the transmitter site. The public notices section of the local newspaper is a good place to get advance notice of tower construction since it is affected by zoning in many areas. Attend any public hearings (bring your local lawyer if necessary) and get on the record there. Keep the station's chief engineer and engineering consultant well informed. Have the station's attorney review any contracts from the tower proponent and write in additional conditions if warranted. Enlist the help of other AM broadcasters and write your elected representatives in Congress demanding that the FCC's 1989 policy statement not be weakened (cite FCC Report No. CL-40-90, 14 November 1989). (If you don't believe that writing representatives in Congress works, read past issues of **RW** or other trade magazines and see what WJDM in Elizabeth, N.J., accomplished a couple of years ago.)

I will restate what I stated in my June 14 letter since money ultimately is the crux of this situation. Simple fairness dictates that no AM broadcaster should be left "holding the bag" and incur expenses through no fault of his own. This includes but is not limited to degraded coverage, noncompliance with existing station authorization (high M.P.s due to reradiation from new tower), and/or expensive engineering fees to retune the directional array and supporting documentation to reestablish or modify the terms of the station authorization due to uncontrolled encroachment of towers. AM directional work is expensive and you get what you pay for. Contrary to Mr. Bixby's implication, the AM licensee has the right to dictate who does work on the AM array.

R. Morgan Burrow, Jr.
Rockville, MD

Historic Value

Dear **RW**,

Want you to know that I thoroughly enjoy your *Radio Roots* and related topics. I save all those segments to read and re-read. You are not just writing a perishable magazine, you are providing a valuable historical resource. Case in point is your exceptional coverage of the WCBS-FM broadcast of WABC and WMCA disc jockeys. I was in New York in the U.S. Army in 1962-63 and recall those great days of those great stations. It should be noted that Dan Daniels of WMCA and Herb Oscar Anderson of WABC used to work here in Minneapolis at WDGY before they went to New York.

I also enjoyed the remembrance of Carlton E. Morse (July 26, **RW**) and wonder if someone could do a remembrance of the CBS radio program, "Yours Truly, Johnny Dollar?" I would especially like to know who did the orchestration and what orchestra recorded the theme.

And on another topic entirely, I am a dyed-in-the-wool classical music listener. It would be a very dark day in the history of radio if public stations that carry classical music ever went off the air. Same goes for the wonderful shows on spoken word, including the very informative and entertaining "Car Talk" from National Public Radio. The FCC should allow a combination commercial and non-commercial/listener supported radio service, if it is not yet allowed, to enable public stations to survive.

Having worked for two excellent commercial classical stations that did not survive on this format, I point to two outstanding examples of stations that offer classical music that have survived in this area of the country: KSJN/Minnesota Public Radio, headquartered in Minneapolis and WCAL, Northfield, Minn. I think it would be a miracle if a commercial classical station would ever again make it in this market.

Jim Stokes
Minneapolis, MN

Too Many Vested Interests

Too much effort is being placed by the EIA/NAB DAB subcommittees on placating too many groups. By allowing Eureka-147 to enhance its system for the field portion of the DAB tests, the subcommittees have further delayed DAB's arrival date in this country. By allowing Eureka-147 to modify or enhance its system, the subcommittees had no choice but to allow the other, mostly in-band, on-channel, proponents to do likewise.

The end result is troubling: Another eight months at least before a recommendation can be made to the FCC — and all to allow a system that operates at L-band to blanket the field route with a signal. Last time we checked, an L-band allotment for DAB was in direct opposition to the government's stated policy.

The focus should be finding which in-band system fits the bill for U.S. radio. Broadcasters continue to maintain they do not want the out-of-band system, Eureka-147, that many countries abroad are adopting for transmission at L-band.

A cursory look around the globe reveals that DAB (using Eureka-147) is well on its way to full implementation in places as far away as Poland, Germany, England, and as near as Canada (see page 1). This industry's inability to move the testing process forward while keeping the end result in its sights is disconcerting.

The time has come for the Federal Communications Commission to realize that those making a recommendation on the choice of DAB implementation in this country have too many vested interests in seeing a certain system succeed.

EIA (through its subcommittees) should stop confusing the issue by stacking the deck in favor of Eureka-147. Its stance of serving the interests of U.S receiver manufacturers still does not wash. Two of Eureka-147's driving partners are Europe-based Thomson and Philips — both members of the EIA.

Again, this page calls upon the NAB to step up its efforts to protect the interest of U.S. broadcasters and take a leading role in the evaluation process and ensure that its membership's interests are served before those of EIA's. There needs to be a better system of checks and balances, particularly now, at the onset of the field tests. There needs to be a steady hand driving the process forward.

—RW

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Editor in Chief.....Lucia Cobo
Managing Editor.....Whitney Pinion
Technical Editor.....Alan Peterson
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Staff Writer.....Lynn Meadows
Assistant Editor.....Christopher Nicholson
Technical Advisors.....John Bisset, Tom McGinley
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Assisstant Editorial Director/Audio.....Alan Carter

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Next Issue of Radio World December 13, 1995

World Radio History

WPVQ Uses EBS 'Monitors for Hire'

by Lynn Meadows

DEERFIELD, Mass. Owners and engineers who are ready to take advantage of the recent unattended operation rules may want to consider an Emergency Broadcast System (EBS) like the one at WPVQ(FM).

WPVQ is a satellite-fed country station whose employees typically work regular business hours. The station hired a building security monitoring company to catch any nighttime and weekend EBS alarms.

Bob Shotwell, co-owner and chief engineer, installed the EBS receiver at the nearby security company when the station first went on the air in July 1994.

The security company has a list of procedures to follow based on the type of alarm being sent. For a regular test, employees go through a short list of phone numbers to leave a message that the test was received.

For a weather-related emergency or state activation, the security company has a longer list of numbers that they will call until they reach a person to let them know the nature of the emergency. During most weather emergencies, Shotwell said someone is in the studio anyway taking cancellations and making announcements.

> **We've at least been told that it appears to comply with all of the regulations in place.**
> —Bob Shotwell

For a White House activation, Shotwell said the security company continues down the list calling everyone "from relatives, aunts to even nominal friends until they get someone."

"Prior to the legalizing of unattended operation, either my partner or myself was either at our home remote control location or at the studio at all times," said Shotwell.

"We've at least verbally been told that it appears to comply with all of the regulations that are in place," Shotwell said. He discussed the system with an FCC field inspector at a recent SBE show.

The inspector had two concerns according to Shotwell. He wanted to know how long it took to reach someone when the alarm went off and if WPVQ could rely on the monitoring company.

Shotwell assured him that someone is always at a phone or a beeper and access time is generally less than two minutes. As for being reliable, he pointed out that a monitoring company could be his most reliable option.

"This company makes or breaks their business and their reputation on a specific response to an alarm," said Shotwell. "Can you expect the same thing from a part-time weekend high school announcer?"

Because the security company monitors the alarm during regular business hours, Shotwell said it is a good cross check. "We have in effect two EBS receivers going off."

Remote control

WPVQ is a "non-participating" station. During a White House emergency, the station must broadcast an EBS message and go off the air.

In a White House emergency, assuming the phone system is functional, Shotwell or his partner can call in via modem and run a macro that will broadcast an EBS announcement complete with the two tone.

After the announcement, they can dial up the transmitter and shut it off by remote control. "Within a couple of minutes at the very longest we could run the announcement," said Shotwell.

"We can do everything at home with the computer that we can do in the studio. We have no cart machines. All of the audio is on computer," he said.

WPVQ uses the Digital DJ computer system which has four different audio sources available. One is the computer audio itself, one is satellite audio, the third is the EBS two tone and the fourth is a dial-up telephone. The announcement of an actual emergency and who to listen to when the station goes dark is preloaded on the computer.

Shotwell recommended dial-in capability for anyone looking for a computer system. His wife is the traffic controller at WPVQ. EBS aside, he said it is faster and easier to check the kill date on a spot from home than to drive to the studio.

"That has nothing to with EBS. It has everything to do with trying to make life a little more convenient."

Unattended operation

"The relaxation of the rules that allows unattended operation only means that I can go shopping and my partner can go to the movies and that somebody else can go someplace else and it's legal."

But Shotwell does not plan to stray too far.

"This isn't a matter of complying with the regulations. It's a matter of business sense," he said. WPVQ's transmitter, for instance, is monitored by Sine-Systems remote control which takes readings every 10 seconds.

When the readings are too high or low, the system automatically calls the studio, Shotwell's house and his partner's house.

"If there is no one for it to reach, we are off the air. Forget rules and regulations, we are off the air, we are losing money."

Shotwell said that the use of a security company would work "primarily for a station that either is satellite fed or has some type of jukebox automation system."

He said he got the idea to use a security company when he read that someone else was using an all-night convenience store to help with their monitoring. Security companies are used to alarms, said Shotwell.

"The only difference is instead of building security being breached, it's an EBS alarm. I haven't spent a lot of money and I haven't torn my hair out trying to fuss over the details. It just seemed to be so incredibly simple," said Shotwell.

Of course, WPVQ's system is still subject to the false tripping engineers have noticed since the EBS tone was shortened in July. "If we were going to have to live with this for the next 17 years, I'd be bothered by it." For now, Shotwell just tells the security firm to reset their receiver.

Shotwell said he was not sure how his system will change for the new Emergency Alert System which must be in place by Jan. 1, 1997.

"I'm really in a wait-and-see mode. I don't know what's going to be available for equipment. I don't know how adaptable that's going to be for what I have now and what I'm doing now. I may have to reinvent the wheel."

WPAT Sells for $103M

▶ continued from page 1

now has only three Hispanic stations. By comparison, Miami currently has 14 and Los Angeles has a dozen Hispanic broadcast outlets.

"The market is expanding," said Gene Bryan, vice president and general manager for New York City's SBS stations, including the new WPAT-FM. "We would not have made the investment if we didn't believe this."

Bryan cautioned observers of New York broadcasting not to confuse traditional Spanish language radio with the newly-expanding Hispanic radio market.

"Spanish is only one segment of the total Hispanic market," he said. "We look at the market in broader terms. There are different types of Hispanics in New York City. This is an untraditional market."

SBS, said Bryan, has developed an expertise on the Hispanic market that breaks it down into different linguistic and cultural subgroups. "There are opportunities to target each one of those individually," he said.

Currently SBS uses its top-rated WSKQ-FM to target Caribbean listeners and WSKQ(AM) to target Mexican and Central Americans. "Two different linguistic models and two different cultural models," noted Bryan.

The recent station sales leave SBS, who paid $83.5 million for its new FM, in control of two FMs — WSKQ-FM and WPAT-FM — and one AM, WSKQ. Heftel Broadcasting, which currently owns Spanish-language news/talk WADO(AM), will add WPAT(AM) creating what is expected to be an Hispanic AM duopoly in the market. Heftel paid $19.5 million for the AM acquisition.

SBS will house all three stations at its headquarters at 26 West 56th Street, said Alfredo Alonso, vice president/general manager of SBS's New York stations.

"All three stations will be run from a single facility," he said. "We expect to close sometime in mid-February and we will go on the air with the new format at the point of transfer."

SBS is holding its new format choice "close to the vest," said Kathleen Bohan, director of research and marketing at Katz Hispanic Media in New York. However, she said, the Hispanics least served in the market now are older listeners who would favor a soft adult contemporary sound.

"That segment was recently vacated by WSKQ(AM) when it moved to the Mexican-based sound," she said.

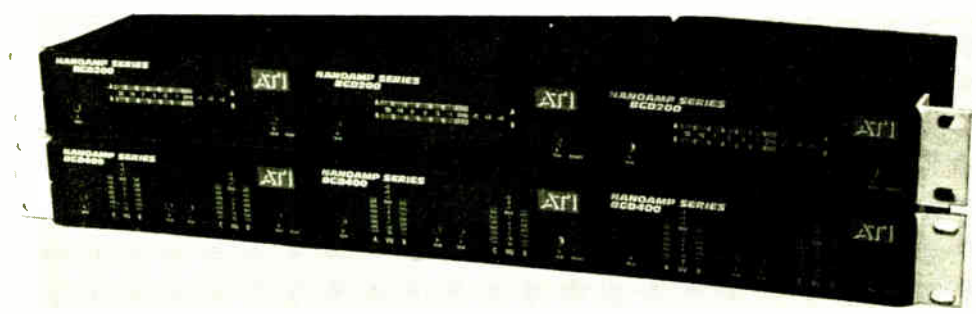
As New York City's sole Hispanic FM, WSKQ-FM has been a stunning success story. Only five years old, it is the only foreign language broadcaster ever to penetrate New York's highly competitive top 10 on a 12+ basis. (It was the number three 12+ station in the Spring Arbitron ratings and its annual revenue was $20 million, a 52 percent increase over the previous year.)

The station's breakthrough came when it abandoned a traditional strategy of trying to be everything to New York City's three million Hispanic listeners. Alonso, who also programs the station, is credited with hitting the magic formula when he targeted a niche audience of Caribbean listeners with what is called the Mega 97.9 format.

The complex format — known as Hurban (Hispanic urban) — is a mix of salsa (Caribbean dance), merengue (Dominican dance), American dance classics and contemporary American and Spanish ballads. It features DJs who speak both Spanish and English on the air. In the past year, it has been so successful that it's drawing non-Hispanic listeners to the station as well.

Though the Hurban format put WSKQ-FM over the top, Bohan noted that its listenership has been gradually building since 1990. She said all one has to do is look at WSKQ-FM's steady growth with its main adult 25-54 audience.

"In the fall of 1990 they were ranked 20th (by Arbitron), in 1991 they were ranked 14th, in 1992 they were 11th, in '93 they were seventh and in '94 they were second," she said. "They didn't just rocket into that position. That's pretty steady growth. They've had phenomenal success in a market that's only 16 percent Hispanic."



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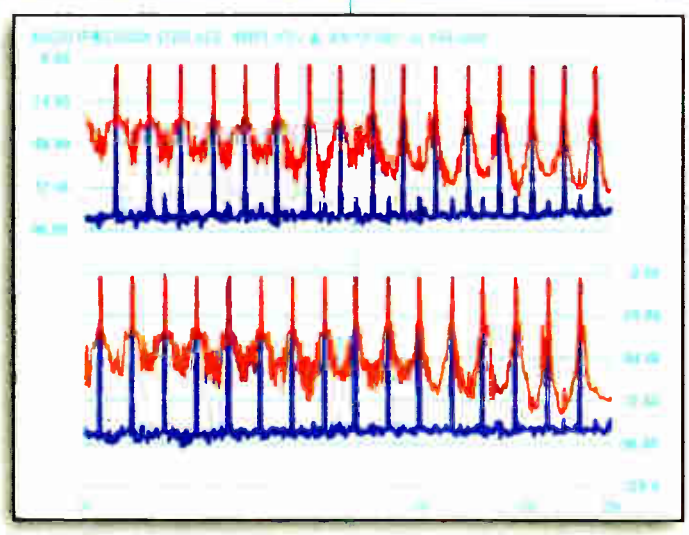

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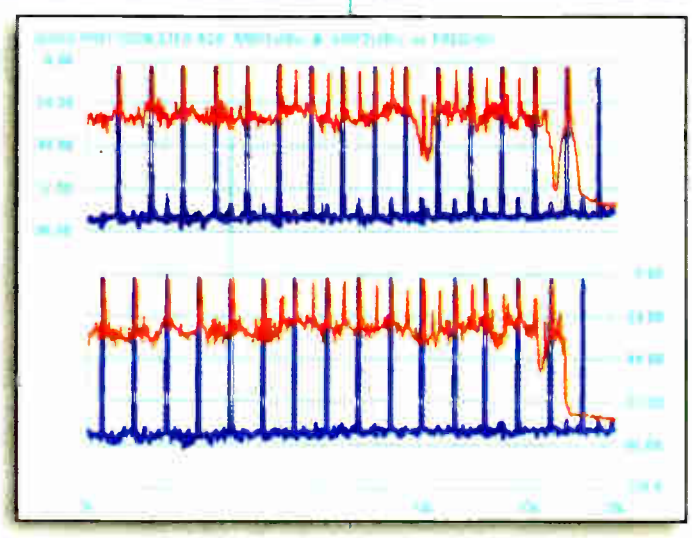

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Graphs are produced using the protocol from Audio Precision Tech Note #14. Complete test results available upon request.

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World Radio History

Canada Finalizes DAB Licensing

▶ continued from page 1

147 system as a technical standard for digital radio broadcasting in Canada," and with the Department of Industry's September 1995 release "of a draft national allotment plan for terrestrial digital radio broadcasting (DRB) in the L-band ... there seems to be no significant technical impediment to the introduction of digital radio services in Canada in the near future."

Two points stand out in this policy statement, titled "Public Notice CRTC 1995-184."

The first is that the CRTC's DAB license, called a "transitional license" because the commission still has to establish its longterm DAB policy, can now be acquired by existing station owners without the expense of a public hearing.

"All AM and FM radio licensees who wish to use digital radio facilities to provide programming that would consist largely of a simulcast of their existing services will automatically qualify for these licenses," states CRTC 1995-184 in an effort to encourage broadcasters to move to DRB.

The second is the name of the license itself. In the initial draft of the commission's DAB policy, it was called an "experimental license," which raised questions in the industry.

"The term 'experimental' implied to most people who read it that this was an 'iffy proposition,'" said Steve Edwards, vice president of corporate engineering and technology at Rogers Broadcasting in Toronto. "They give you a license, but they might take it back at any time."

"During the next stage (of DAB policymaking) we will replace the transitional digital radio licenses with regular-term licenses. This replacement will be virtually automatic and will likely involve a simple and streamlined process," stated Spicer in an effort to clarify the status of transitional licenses.

Speaking for private broadcasters, CAB President and CEO Michael McCabe showered praise on the CRTC's current DAB policy, which reflects many changes that were requested by the industry.

"Our people have finally heard the starting gun," said McCabe at the convention. Commenting on the money poured into existing experimental DAB stations currently on air in Toronto, Montreal and Ottawa, he said, "what we haven't had (in the past) is commitment to the business of digital radio. I think you'll see that happen in the next six months or so."

Certainly the big guns like Rogers — which owns at least 20 stations — are prepared to take the leap. Despite the absence of consumer L-band DAB receivers in the marketplace — a gap which is expected to last well into 1997 — Edwards said that his company has already put aside money to simulcast its two Toronto stations — 680 News and CHFI-FM — in DAB sometime next year.

Still, many managers of smaller radio stations at the CAB convention expressed reservations about investing in DAB, particularly when nearly half of the industry is running in the red.

Politics Mire U.S. DAB

▶ continued from page 1

"That is based primarily on what I've seen for laboratory results of other systems and, of course, knowledge of the Eureka system, which is being implemented pretty much around the world, outside the United States," Pinkham said.

One option for implementation in the United States, according to Pinkham, would be the use of taboo TV channels in the lower VHF band with four Eureka blocks in each. This implementation would yield 16 DAB stations in one TV channel.

"Who knows what could develop in the future; with the FCC selling off spectrum, most anything could happen."

Rock and a hard place

After the NTIA and EIA agreed on terms for spectrum sharing, it was revealed that Eureka needed a dual-transmitter system to cover the long test routes through San Francisco. Other proponents argued that if Eureka was allowed to add a second transmitter, they too should be allowed to modify their systems.

In the interest of harmony, the EIA agreed and urged proponents to submit the intended changes for their systems by the end of October.

According to Lisa Fasold of the EIA many of the desired changes were "drastically different than what was done in the lab." Fasold said some of the changes were in modulation schemes and hardware.

At the meeting in early November, the participants hashed out an agreement whereby all participants have until Jan. 31, 1996, to modify their systems for the first round of field tests.

If that deadline cannot be met, modifications to the equipment can still be submitted by April 30, 1996, for the second round of field tests.

Fasold said results will be released after each round of tests to encourage proponents to get their equipment in early.

"When we tried to put our foot down, I had the feeling some proponents would just walk away from the table," Fasold said. According to Fasold, the other solution was not to test Eureka.

Asked if people were willing to walk away, Jeff Andrew of USA Digital Radio (USADR) said, "I know we were." He added, "They were going to allow Eureka to test with two transmitters, which we thought was a change. So if they were going to allow one change, we thought they should allow two changes."

Both AT&T and USADR have in-band, on-channel (IBOC) systems. IBOC is popular among U.S. broadcasters who see it as the least disruptive system.

Nikil Jayant, head of the signal processing branch for AT&T, said he was reviewing his options. He added that he would probably submit the system from the lab test in February and a modified system in May.

As for USADR, Andrew said "We probably will make some changes and hopefully make them to the first deadline." Pinkham said the Eureka system and transmitters were ready in August.

All the systems tested in the lab will also be field tested, Fasold said. Modified systems that differ drastically from the lab-tested systems will be put in an appendix to the test results.

According to Andrew, if some of the systems are dramatically different, the EIA may go back to the lab for additional tests for verification.

Asked if the collection of data from different systems will be anything more than a hodgepodge of data, Jayant was optimistic.

"We can say that here is part of the result which, when combined with the lab test results, says the following things, and, without undoing any of that, there is some new evidence because of the fact that technology has advanced."

Lab tests

"The only thing that is unresolved is the multipath simulator," Andrew said after the five-hour National Radio Systems Committee (NRSC) meeting on DAB earlier this month.

DAB proponents USADR, AT&T, and VOA/JPL wrote a letter following the release of the lab test results in August questioning the multipath tests.

"Obviously, we feel that there were very significant level changes and they affected our system significantly," Andrew said, "but we don't know exactly what's going to happen. We are still working with the EIA."

The EIA returned to the NASA Lewis Research Center lab with USADR's own RF channel simulator to investigate why the lab results varied so greatly from USADR's own personal tests.

While there, they were expected to perform the tests on USADR's system using both the Doppler and Rayleigh multipath tests.

The EIA also agreed in the NRSC meeting in October to redo the Canadian Research Centre (CRC) chart from the lab test. Some proponents felt that the chart unfairly grouped the systems. After a two-hour discussion during the meeting, the CRC chart will be redone in alphabetical order by system. Any reference to the old grouping will be deleted from the accompanying text.

"I'm a bit disappointed in the testing process," Pinkham said. "It's become so political that many of the participants seem to have lost sight entirely of the intent. The intent, of course, is to evaluate DAB systems."

Said Fasold, "We've tried the whole way through to have consensus for every action." She added that even on a 10 to two vote, the committee will pause to see what will make those two happy.

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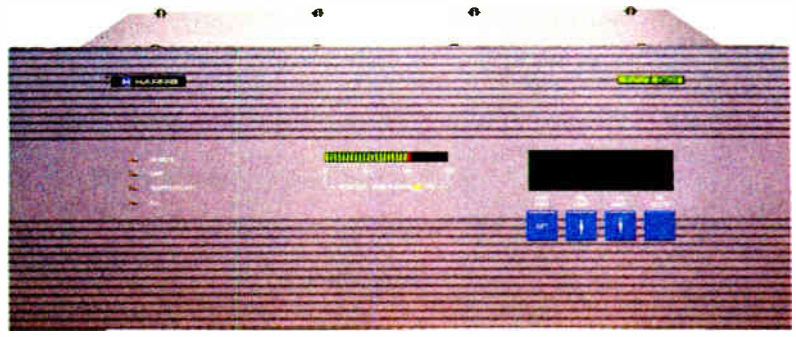

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World Radio History

RealAudio Adds 'Netcasting' Option

by Frank Beacham

SEATTLE Progressive Networks announced an upgrade to its RealAudio technology that boasts FM-quality sound and live "netcasting" capability over the Internet.

The new software, RealAudio version 2.0, also allows users to deliver synchronized multimedia visuals with the audio signal and adds the capability for broadcasting a live event to a large number of listeners simultaneously.

RealAudio, introduced last April, is a real-time, audio-on-demand system that overcomes the need for Internet users to download audio files for later listening. RealAudio enables users equipped with conventional multimedia personal computers and standard phone lines to browse, select and play back audio content on-demand.

Improved quality

In its first generation software, RealAudio was limited to voice-grade-quality sound optimized for use with 14.4 kilobaud modems. Version 2.0 includes a new 18 kbps algorithm that will offer significantly improved audio quality over 28.8 kilobaud modems or higher connections, the company said.

In order to accommodate computer users with both types of modems, the audio signal will have to be encoded twice. However, the RealAudio 2.0 audio processing software will encode the signal with both algorithms simultaneously.

"The new RealAudio 2.0 player will automatically negotiate the best audio quality available to the user. It is actually smart enough to look at the performance you are getting through your connection," said Martin Dunsmuir, manager of the RealAudio server product.

"I've encoded 15 different types of music and they all sound like great FM quality," said Robert Abbett, president of Internet Radio Hawaii. In addition to the improved audio quality, Progressive introduced new real-time encoding and serving technology that allows content providers to broadcast events over the Internet as they are happening, without time delays.

New architectural support

This is coupled with new architectural support for software that allows hybrid narrowcasting and multicasting. The company said a network of special RealAudio server software, called splitters, will be deployed throughout the Internet during 1996. Over time, the splitters will enable RealAudio customers to deliver popular programming to tens or even hundreds of thousands of listeners simultaneously.

"A splitter receives content from somewhere else and then re-broadcasts it," said Dunsmuir. "If you want to reduce the bandwidth requirements between a listening site and the rest of the Internet, you use a splitter."

Progressive Networks, said Dunsmuir, plans to create a series of special audio events over the next year that will allow large numbers of Internet users to tune in at the same time.

"Nobody has done that before," he said.

Another breakthrough in the new RealAudio software is multimedia synchronization. This allows content providers to control how the RealAudio player appears on screen and embeds instructions into the audio stream that can generate synchronized visuals.

Can be supplemented

With this new multimedia capability, audio programs can be supplemented with a wide range of data. For example, a baseball game could feature a fully animated baseball field where cartoon-like characters imitate the action of the game.

In addition to the new features, RealAudio 2.0 will include several open architecture enhancements that will allow third-party application developers to take advantage of the system. Third parties will have access to APIs (Application Programming Interface) for RealAudio's Playback Engine and Coder/Decoder.

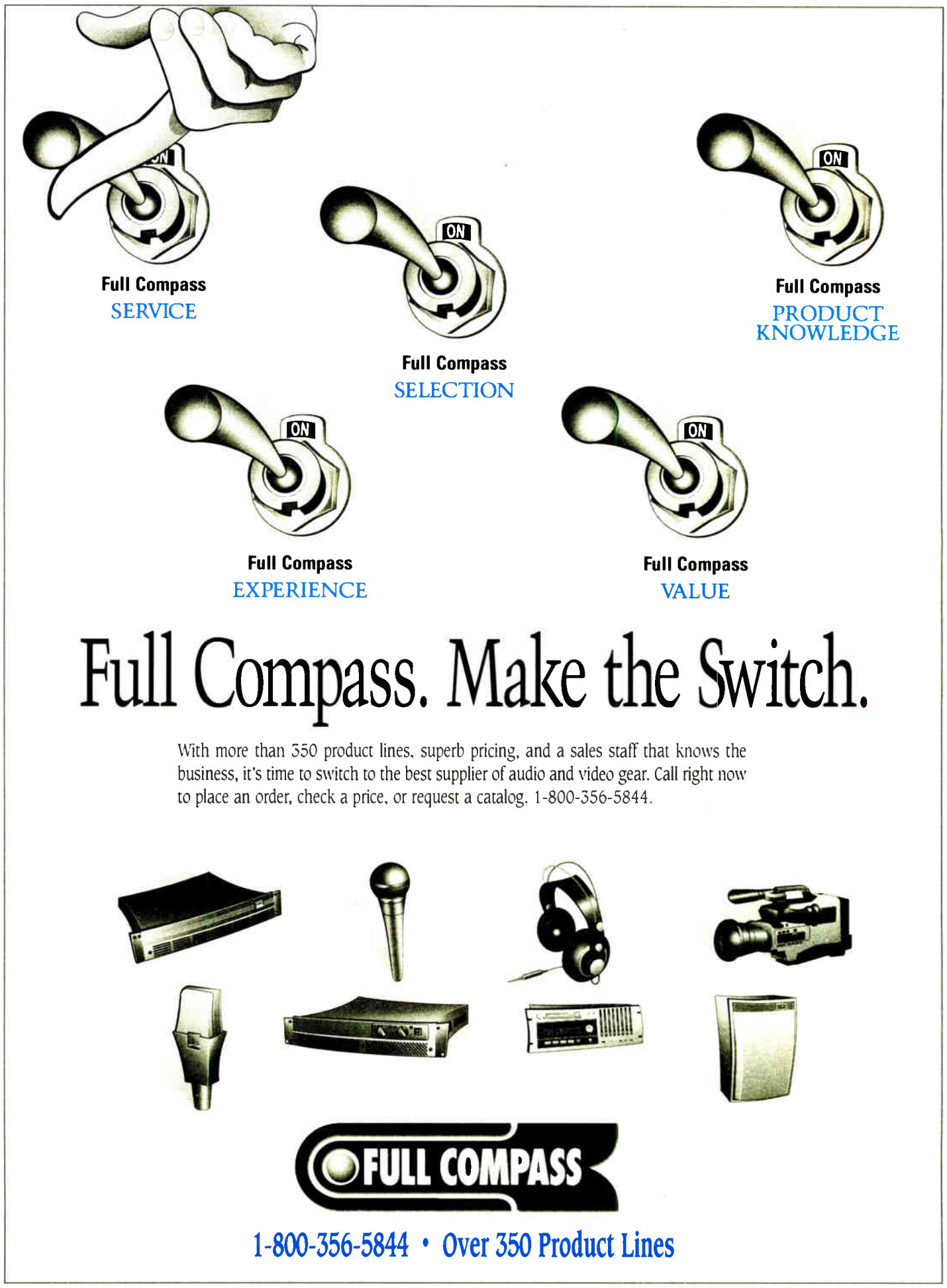
The new release also includes a Netscape Plug-In which can be used to seamlessly integrate RealAudio functionality directly into Netscape Navigator 2.0 client software, which is now in beta testing on the Internet.

Committed

"We are committed to open standards for the Internet and believe that publishing the RealAudio APIs and delivering plug-ins will enable on-line application developers to integrate the RealAudio standard into their software so that users can benefit from the quick and easy audio-on-demand system that we have created," said Rob Glaser, president and CEO of Progressive Networks.

Since its introduction last April, more than 600,000 RealAudio players have been downloaded from the RealAudio web site. Audio programming is now available from more than 150 RealAudio-equipped Web sites. Current net content providers include ABC Radio, NPR, numerous call letter radio stations and audio programmers.

RealAudio 2.0 will ship in January, 1996. The beta version is available for downloading at http://www.RealAudio.com for PCs running Windows 3.1, Windows 95 and Windows NT and for 68040 Macintoshes or PowerPCs.



Circle (180) On Reader Service Card

World Radio History

RBDS ROLL CALL

The following is Radio World's quarterly listing of RBDS stations, equipment and receiver manufacturers, and service providers. If you would like to be included in the next listings, contact Lucia Cobo at 703-998-7600.

RBDS Equipment Manufacturers/Distributors

AEV (Encoder)
Via Saviolo Budrie
Di S. Perisceto
Bologna
Italy

Belar Electronics Labs Inc.
PO Box 76
Devon PA 19333

Broadcast Supply Worldwide
(Encoder)
7012 27th St. West
Tacoma, WA 98406

Circuit Research Labs
(Encoder)
2522 W. Geneva
Tempe, AZ 85282
Contact: Valerie Hummer
602-438-0888
Reader Service 85

Harris Allied (Encoder)
3712 National Road West
Richmond, IN 47374

Inovonics
(Encoder/Decoder)
1305 Fair Ave
Santa Cruz CA 95060
Contact: Anne Chaney
408-458-0552
Reader Service 131

Modulation Sciences
(Encoder/Monitor)
12A World's Fair Drive
Somerset, NJ 08873
Contact: Judy Englert
908-302-3090
Reader Service 134

RDS Diagnostix (Test/Decoder)
74 Hanover Road
Mountain Lakes, NJ 07046

Audio Broadcast Group
(Encoder)
2342 S Division Ave
Grand Rapids, MI 49507

AZTEC S.A. (Encoder)
31 Rue Du Chemin de Fer
67200 Strasbourg
France

RE America, Inc. (Encoder)
31029 Center Ridge Road
Westlake, OH 44145
Contact: Soran Pihlman
216-871-7617
Reader Service 56

Rohde and Schwarz
(Encoder)
4425 Nicole Drive
Lanham, MD 20706

SCA Data Systems (Encoder)
2912 Colorado Ave.
Suite 200
Santa Monica, CA 92404

Teli AB (Encoder)
14980 Nunashamn
Sweden

Tectan (Encoder)
Box 27157
Concord, CA 94527

VG Electronics (Encoder)
Theaklen Drive
Hastings East Sussex TN34 1YQ
England

RBDS Receiver Manufacturers (with current U.S. models)

Advanced Digital Systems
(PC RDS Receiver)
13909 Bettencourt Street
Cerritos, CA 90701
Contact: Mike McCoy
800-888-5244
Reader Service 177

Axcess (Paging)
6620 Riverside Drive, Ste 200
Metairie, LA 70003

AZTEC S.A. (Mobile Data Receiver)
31 Rue Du Chemin de Fer
67200 Strasbourg
France

Delco Electronics (Car)
1 Corporate Center MS CT-16A
Kokomo, IN 46904

Denon (Car/Home)
222 New Road
Parsippany, NJ 07054
Contact: John Casey
201-575-7810
Reader Service 155

Grundig (Portable)
3520 Haven Ave., Unit L
Redwood City, CA 94063

Indy Automotive Electronics
2420 E 55th Place
Indianapolis IN 46220

Modulation Sciences (Data)
12A World's Fair Drive
Somerset, NJ 08873

Onkyo (Home)
200 Williams Drive
Ramsey, NJ 07446

Philips Car Stereo (Car)
9600 54th Avenue
N. Minneapolis, MN 55442

Pioneer (Car)
2265 East 220th St.
Long Beach, CA 90810

RBDS Service Providers

Axcess/Spartan (Paging)
6620 Riverside Drive, Ste 200
Metairie, LA 70003

DCI
(Global Positioning)
10121 Miller Ave,
Cupertino, CA 95014
Contact: Jim Bradley
408-446-8350
Reader Service 109

Coupon Radio
(Information Services)
10 Rockefeller Plaza
New York, NY 10020

Sage Alerting (EBS)
700 Canal Street
Stamford, CT 06902

SATX (Data Broadcast Software)
Milestone Technologies
2221 Mariner Circle
Raleigh, NC 27603

Specialized Comm.
(Music Information)
1638 153rd St. SE
Bellevue, WA 98007
Contact: Allen Hartle
206-641-9043
Reader Service 42

Terrapin (IVHS Services/Diff-GPS)
11958 Monarch Street
Garden Grove, CA 92641

RBDS STATIONS

STATION	FREQ.	CITY
ALABAMA		
WZYP-FM	104.3	Athens
WRJM-FM	93.7	Geneva
ARIZONA		
KZZZ-FM	94.7	Kingman
KKFR-FM	92.3	Phoenix
KSLX-FM	100.7	Scottsdale
CALIFORNIA		
KSBR-FM	88.5	Anaheim
KALX-FM	90.7	Berkeley
KPFA-FM	94.1	Berkeley
KPFB-FM	89.3	Berkeley
KSIQ-FM	96.1	Brawley
KFMF-FM	93.9	Chico
KPPL-FM	107.5	Colusa
KVHS-FM	90.5	Concord
KOHL-FM	89.3	Fremont
KUFX-FM	94.5	Gilroy
KCRH-FM	89.9	Hayward
KHQT-FM	97.7	Los Altos
KKLA-FM	99.5	Los Angeles
KLSX-FM	97.1	Los Angeles
KPCC-FM	89.3	Los Angeles
KPFK-FM	90.7	Los Angeles
KTWV-FM	94.7	Los Angeles
KCRW-FM	89.9	Los Angeles
KFSG-FM	96.3	Los Angeles
KKBT-FM	92.3	Los Angeles
KKGO-FM	105.1	Los Angeles
KREA-FM	93.5	Los Angeles
KSCA-FM	101.9	Los Angeles
KUSC-FM	91.5	Los Angeles
KATM-FM	103.3	Modesto
KHOP-FM	104.1	Modesto
KCSN-FM	88.5	Northridge
KSHA-FM	104.3	Redding
KFOX-FM	93.5	Redondo Beach
KNPR-FM*	88.1	Ridgecrest
KSFM-FM	102.5	Sacramento
KPBS-FM	89.5	San Diego
KPLM-FM	106.1	Palm Springs
KYXY-FM	96.5	San Diego
KDFC-FM	102.1	San Francisco
KECG-FM	88.1	San Francisco
KEAR-FM	106.9	San Francisco
KALW-FM	91.7	San Francisco
KFOG-FM	104.5	San Francisco
KFRC-FM	99.7	San Francisco
KKHI-FM	100.9	San Francisco
KKSF-FM	103.7	San Francisco
KUSF-FM	90.3	San Francisco
KSJO-FM	92.3	San Jose
KCBX-FM	90.1	San Luis Obispo
KUSP-FM	88.9	Santa Cruz
COLORADO		
KBCO-FM	97.3	Boulder
KHIH-FM	95.7	Denver
KMJI-FM	100.3	Denver
KCFR-FM	90.1	Denver
CONNECTICUT		
WSHU-FM	91.1	Fairfield
WPKT-FM	90.5	Hartford

World Radio History

DISTRICT OF COLUMBIA
WAMU-FM 88.5 Washington
WASH-FM 97.1 Washington
WETA-FM 90.9 Washington
WDCU-FM 90.1 Washington
WGAY-FM 99.5 Washington
WGTS-FM 91.9 Washington
WHUR-FM 96.3 Washington

FLORIDA
WAPN-FM 91.5 Daytona Beach
WNDB-FM 95.7 Daytona Beach
WSFP-FM 90.1 Ft. Myers
WAOA-FM 107.1 Melbourne
WLRN-FM 91.3 Miami
WTMI-FM 93.1 Miami
WMFE-FM 90.7 Orlando
WOCL-FM 105.9 Orlando
WUFT-FM 89.1 Gainesville
WOWW-FM 107.3 Pensacola
WFLZ-FM 93.3 Tampa

GEORGIA
WDMG-FM 99.5 Douglas
WSTR-FM 94.1 Smyrna
WABE-FM 90.1 Atlanta
WCLK-FM 91.9 Atlanta
WKLS-FM 96.1 Atlanta
WZGC-FM 92.9 Atlanta
WAFT-FM 101.1 Valdosta

IDAHO
KCIX-FM 105.9 Boise

ILLINOIS
KNJZ-FM 100.3 Alton
WRMS-FM 94.3 Beardstown
WCIL-FM 101.5 Carbondale
WCBH-FM 104.3 Casey
WLRW-FM 94.5 Champaign
WBEZ-FM 91.5 Chicago
WCCQ-FM 98.3 Chicago
WJKL-FM 94.3 Chicago
WKKD-FM 95.9 Chicago
WKQX-FM 101.1 Chicago
WLLI-FM 96.7 Chicago
WXRT-FM 93.1 Chicago
WLS-FM 94.7 Chicago
WNUA-FM 95.5 Chicago
WSSD-FM 88.1 Chicago
WNIJ-FM 90.5 DeKalb
WLLR-FM 101.3 East Moline
WAAG-FM 94.9 Galesburg
WKKX-FM 104.1 Granite City
WKBQ-FM 106.5 Jerseyville
WWTE-FM 93.9 Lincoln
WSWT-FM 106.9 Peoria
WDBR-FM 103.7 Springfield
WGFA-FM 94.1 Watseka
WPGU-FM 107.1 Urbana

INDIANA
WYEZ-FM 96.9 Bremen
WSHW-FM 99.7 Frankfort
WENS-FM 97.1 Indianapolis
WZPL-FM 99.5 Indianapolis
WITZ-FM 104.7 Jasper
WZWZ-FM 92.7 Kokomo
WWKI-FM 100.5 Kokomo
WEZV-FM 95.3 Lafayette
WGLM-FM 106.7 Lafayette
WMRI-FM 106.9 Marion
WLTA-FM 94.3 Plymouth
WLEZ-FM 102.7 Terre Haute
WXKE-FM 103.9 Ft. Wayne

IOWA
KGRS-FM 107.3 Burlington
WMT-FM 96.5 Cedar Rapids
KMGO-FM 98.7 Centerville
KRVR-FM 106.5 Davenport
KMFG-FM 103.3 Des Moines
KRUU-FM 98.3 Des Moines
KLYV-FM 105.3 Dubuque
KIAQ-FM 96.9 Ft. Dodge
KOEL-FM 92.3 Oelwein
KJJC-FM 106.9 Osceola
KUOO-FM 103.9 Spirit Lake
KDCR-FM 88.5 Sioux Center
KAYL-FM 101.5 Storm Lake

KENTUCKY
WMMT-FM 88.7 Whitesburg

LOUISIANA
WGGZ-FM 98.1 Baton Rouge
KQXL-FM 106.5 Baton Rouge
WYCT-FM 94.1 Kentwood
KFXY-FM 96.7 Morgan City
WNOE-FM 101.1 New Orleans
KCIL-FM 107.5 Houma
KMJJ-FM 100.1 Shreveport

MASSACHUSETTS
WAAF-FM 107.3 Boston
WBUR-FM 90.9 Boston
WGBH-FM 89.7 Boston
WBOQ-FM 104.9 Gloucester
WBCS-FM 96.9 Newton
WBOS-FM 92.9 Brookline
WCRB-FM 102.5 Waltham
WJMN-FM 94.5 Boston
WMJX-FM 106.7 Boston
WSSH-FM 99.5 Lowell
WXKS-FM 107.9 Medford

MARYLAND
WHFS-FM 99.1 Annapolis
WEAA-FM 88.9 Baltimore
WIYY-FM 97.9 Baltimore
WOCT-FM 104.3 Baltimore
WPOC-FM 93.1 Baltimore
WWMX-FM 106.5 Baltimore
WXYV-FM 102.7 Baltimore
WETH-FM* 89.1 Hagerstown

MICHIGAN
WIOG-FM 102.5 Bay City
WLLZ-FM 98.7 Detroit
WKQI-FM 95.5 Detroit
WJLB-FM 97.9 Detroit
WQRS-FM 105.1 Detroit
WDBM-FM 88.9 East Lansing
WKAR-FM 90.5 East Lansing
WGLQ-FM 97.1 Escanaba
WLAV-FM 96.9 Grand Rapids
WKLQ-FM 94.5 Holland
WRKR-FM 107.7 Portage

MINNESOTA
KAUS-FM 99.9 Austin
KKBJ-FM 103.7 Bemidji
KDNW-FM 97.3 Duluth
KEEZ-FM 99.1 Mankato
KKCK-FM 99.7 Marshall
KBEM-FM 88.5 Minneapolis
KQQL-FM 107.9 Minneapolis
KNOW-FM 91.1 St. Paul
KSJN-FM 99.5 St. Paul
KSTP-FM 94.5 St. Paul
KTIS-FM 98.5 Minneapolis
KDJS-FM 95.3 Willmar

MISSOURI
KFMZ-FM 98.3 Columbia
KGRC-FM 92.9 Hannibal
KYYS-FM 102.1 Kansas City
KMJM-FM 107.7 St. Louis
WFUN-FM 95.5 Saint Louis
WIL-FM 92.3 St. Louis

MONTANA
KCTR-FM 102.9 Billings
KKBR-FM 97.1 Billings
KATH-FM 93.7 Bozeman
KBOZ-FM 97.5 Livingston

NEBRASKA
KNEN-FM 94.7 Norfolk
KESY-FM 104.5 Omaha

NEVADA
KKLZ-FM 96.3 Las Vegas
KNPR-FM 89.5 Las Vegas
KNPR-FM* 88.7 Boulder City
KNPR-FM* 91.7 Beatty
KOMP-FM 99.3 Henderson
KNPR-FM* 88.7 Indian Springs
KNPR-FM* 89.5 Laughlin
KNPR-FM* 88.7 Moapa Valley
KNPR-FM* 88.7 Pahrump
KBUL-FM 98.1 Reno
KNEV-FM 95.5 Reno
KNPR-FM* 88.1 Scotty's Junction
KNPR-FM* 105.1 Searchlight
KLUC-FM* 98.5 Las Vegas
KFMS-FM 101.9 Las Vegas
KWNR-FM 95.5 Las Vegas
KEYV-FM 93.1 Las Vegas
KRRI-FM 105.5 Las Vegas
KOMP-FM 92.3 Las Vegas
KEDG-FM 103.5 Las Vegas
KFBI-FM 107.5 Las Vegas
KYRK-FM 97.1 Las Vegas
KLNR-FM* 91.7 Panaca
KTPH-FM* 91.7 Tonopah
KEYV-FM* 103.5 Laughlin

NEW HAMPSHIRE
WBHG-FM 101.5 Laconia
WLNH-FM 98.3 Laconia

NEW JERSEY
WFPG-FM 96.9 Atlantic City
WKDN-FM 106.9 Camden
WMGQ-FM 98.3 New Brunswick
WBGO-FM 88.3 Newark
WFME-FM 94.7 Newark
WNNJ-FM 103.7 Newton
WPAT-FM 93.1 Patterson
WADB-FM 95.9 Point Pleasant
WPST-FM 97.5 Trenton
WBSS-FM 97.3 Millville
WPSC-FM 88.7 Wayne

NEW MEXICO
KKOB-FM 93.3 Albuquerque
KKSS-FM 97.3 Santa Fe

NEW YORK
WAMC-FM 90.3 Albany
WGY-FM 99.5 Albany
WZRQ-FM 102.3 Albany
WDRE-FM 92.7 Garden City
WMHT-FM 89.1 Schenectady
WSKG-FM 89.3 Elmira
WKJY-FM 98.3 Hempstead
WFUV-FM 90.7 New York
WHCR-FM 90.3 New York
WHTZ-FM 100.3 New York
WNEW-FM 102.7 New York
WNYC-FM 93.9 New York
WHUD-FM 100.7 Peekskill
WBEE-FM 92.5 Rochester
WSIA-FM 88.9 Staten Island
WMRW-FM 98.5 Westhampton

NEW MEXICO
KKOB-FM 93.3 Albuquerque
KKSS-FM 97.3 Santa Fe

NORTH CAROLINA
WKJA-FM 101.1 Belhaven
WMIT-FM 106.9 Black Mtn.
WUNC-FM 91.5 Chapel Hill
WSOC-FM 103.7 Charlotte
WXRA-FM 94.5 Eden
WKOO-FM 98.7 Jacksonville
WCXL-FM 104.1 Kill Devil Hills
WTQR-FM 104.1 Winston-Salem

NORTH DAKOTA
KSSS-FM 101.5 Bismark
KDVL-FM 102.5 Devils Lake
KRRB-FM 92.1 Dickinson
KFNW-FM 97.9 Fargo
KNOX-FM 94.7 Grand Forks
KQDJ-FM 95.5 Jamestown
KYYZ-FM 96.1 Williston

OHIO
WOUB-FM 91.3 Athens
WGUC-FM 90.9 Cincinnati
WVXU-FM 91.7 Cincinnati
WWNK-FM 94.1 Cincinnati
WCLV-FM 95.5 Cleveland
WCPN-FM 90.3 Cleveland
WGAR-FM 99.5 Cleveland
WENZ-FM 107.9 Cleveland
WKSU-FM 89.7 Cleveland
WLTF-FM 106.5 Cleveland
WQAL-FM 104.1 Cleveland
WLVQ-FM 96.3 Columbus
WDFM-FM 98.1 Defiance
WKRJ-FM* 91.5 New Philadelphia
WGLE-FM 90.7 Toledo
WKKO-FM 99.9 Toledo
WGTE-FM 91.3 Toledo
WXKR-FM 94.5 Toledo
WKRW-FM* 89.3 Wooster
WKBN-FM 98.9 Youngstown
WHIZ-FM 102.5 Zanesville
WOUZ-FM 90.1 Zanesville
WGLE-FM 90.7 Lima
WZAK-FM 93.1 Cleveland
WZJM-FM 92.3 Cleveland Heights

OKLAHOMA
KSYE-FM 91.5 Frederick
KIRQ-FM 98.1 Lawton
KTST-FM 101.9 Oklahoma City
KXXY-FM 96.1 Oklahoma City

OREGON
KZEL-FM 96.1 Eugene
KYTE-FM 102.7 Newport
KOPB-FM 91.5 Portland
KKRZ-FM 100.3 Portland
KMCQ-FM 104.5 The Dalles

PENNSYLVANIA
WRTI-FM* 97.1 Allentown/ Bethlehem
WITF-FM 89.5 Harrisburg
WRVV-FM 97.3 Harrisburg
WIBF-FM 103.9 Jenkintown
WROZ-FM 101.3 Lancaster
WDAS-FM 105.3 Philadelphia
WFLN-FM 95.7 Philadelphia
WKXW-FM 101.5 Philadelphia
WHYY-FM 90.9 Philadelphia
WMGK-FM 102.9 Philadelphia
WMMR-FM 93.3 Philadelphia
WRTI-FM 90.1 Philadelphia
WPLY-FM 100.3 Philadelphia
WUSL-FM 98.9 Philadelphia
WXPN-FM 88.5 Philadelphia
WIOQ-FM 102.1 Philadelphia
WXTU-FM 92.5 Philadelphia
WWDB-FM 96.5 Philadelphia
WDUQ-FM 90.5 Pittsburgh
WRTI-FM* 97.7 Reading

RHODE ISLAND
WWBB 101.5 Providence

SOUTH CAROLINA
WWDM-FM 101.3 Sumter

SOUTH DAKOTA
KOLY-FM 99.5 Mobridge
KRRO-FM 103.7 Sioux Falls
KBWS-FM 102.9 Sisseton

TENNESSEE
WSKZ-FM 106.5 Chattanooga
WQZQ-FM 102.5 Dickson
WYPL-FM 89.3 Memphis
WYCQ-FM 102.9 Shelbyville

TEXAS
KEAN-FM 105.1 Abilene
KNLE-FM 88.1 Austin
KNTU-FM 88.1 Denton
KTTX-FM 106.1 Brenhane
KTEX-FM 100.3 Brownsville
KKYS-FM 104.7 Bryan
KORA-FM 98.3 Bryan
KTEX-FM 106.9 Bryan
KAYD-FM 97.5 Beaumont
KQXY-FM 94.1 Beaumont
KYKR-FM 95.1 Beaumont
KRTK-FM 97.1 Cleveland
KCBI-FM 90.9 Dallas
KDMX-FM 102.9 Dallas
KERA-FM 90.1 Dallas
KVTT-FM 91.7 Dallas
KYNG-FM 105.3 Dallas
KPLX-FM 99.5 Fort Worth
KBNA-FM 97.5 El Paso
KEGL-FM 97.1 Fort Worth
KBXX-FM 97.9 Houston
KMJQ-FM 102.1 Houston
KHYS-FM 98.5 Port Arthur
KILT-FM 100.3 Houston
KRTK-FM 97.1 Cleveland
KUHF-FM 88.7 Houston
KJMZ-FM 100.3 Irving
KOOI-FM 106.5 Jacksonville
KYKX-FM 105.7 Longview
KFMX-FM 94.5 Lubbock
KKMY-FM 104.5 Orange
KFTG-FM 88.1 Pasadena
KATX-FM 97.3 Plainview
KCRN-FM 93.9 San Angelo
KXTN-FM 107.5 San Antonio
KRTS-FM 92.1 Seabrook
WACO-FM 99.9 Waco

UTAH
KSOS-FM 106.9 Ogden
KSOS-FM* 92.1 Salt Lake City
KSOS-FM* 96.7 Salt Lake City
KISN-FM 97.1 Salt Lake City
KLZX-FM 93.3 Salt Lake City
KSOS-FM* 98.3 Utah County

VIRGINIA
WLTY-FM* 95.7 Norfolk
WNVZ-FM 104.5 Norfolk
WESR-FM 103.3 Onley
WKOC-FM 93.7 Virginia Beach
WCDX-FM 92.7 Richmond

WASHINGTON
KISM-FM 92.9 Bellingham
KXXO-FM 96.1 Olympia
KFAE-FM 89.1 Richland
KISW-FM 99.9 Seattle
KUOW-FM 94.9 Seattle
KMPS-FM 94.1 Seattle
KMTT-FM 103.7 Seattle
KDRK-FM 93.7 Spokane
KEZE-FM 105.7 Spokane
KRPM-FM 106.1 Tacoma
KVTI-FM 90.9 Tacoma

WEST VIRGINIA
WHCM-FM 99.1 Parkersburg
WKWK-FM 97.3 Wheeling

WISCONSIN
WIZM-FM 93.3 LaCrosse
WERN-FM 88.7 Madison
WNWC-FM 102.5 Madison
WUWM-FM 89.7 Milwaukeee
WMYX-FM 99.1 Milwaukee
WMSE-FM 91.7 Milwaukee

*translators

World Radio History

FCC OKs Downgrade of WOWO Signal

by Lynn Meadows

FORT WAYNE, Ind. Clear channel WOWO(AM) at 1190 kHz will celebrate its 70th birthday this coming spring by changing its original 50 kW nighttime signal to a highly directional 9.8 kW.

Last month, the Federal Communications Commission (FCC) granted Inner City Broadcasting Corp. permission to drop WOWO's nighttime power so its New York station, WLIB(AM) can have a 30 kW nighttime signal. The switch, which must be simultaneous, is expected to happen in about six months.

The decision was a disappointment to WOWO Listeners' Guild leader Peter George. George formed the Listeners' Guild as soon as Inner City purchased WOWO in September 1994.

George who has never been to Fort Wayne has been a loyal WOWO listener since 1968.

"Right now I feel like a very close friend of the family is dying," he said.

The plan was "not to put down Inner City Broadcasting or WLIB," George explained. He said he supported WLIB's other efforts to get a nighttime signal. The other option Inner City had pursued, according to George was a move to 1200 kHz in the evenings. "I was for that 100 percent," he said.

Legend has it that WOWO stands for "We're On We're On!" from the early days. According to the Listeners' Guild, the evening signal reaches 28 states and five Canadian provinces.

George said WOWO's new highly directional nighttime array will aim towards Michigan and will barely put a city-grade signal over parts of Fort Wayne.

George said over 50 steadfast members from the United States and Canada joined the guild. He said the FCC received over 300 letters protesting the petition.

"We felt it was not right emasculating a 70 year old station," he said.

Although Inner City owns WOWO, Pathfinder has managed the station since its purchase. According to George, much of the local programming has been replaced with satellite shows. George said that "the outrage pretty much dwindled out" when the programming became homogenous.

George said he hopes the station will return to more local programming once the swap takes place. He said that after the signal change, it would be a "nice gesture" for Pathfinder to put the station on the Internet.

BY POPULAR DEMAND

The GE 60 Stereo 1/3-Octave Equalizer:

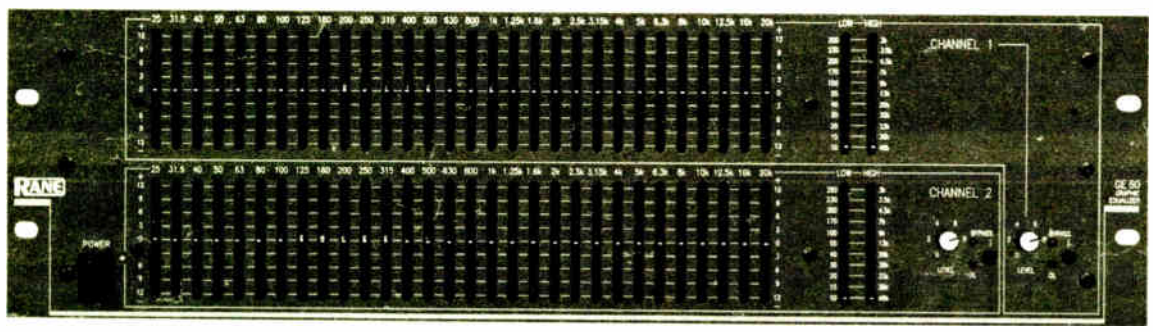
The Crowd Pleaser

The company that first brought you Constant Q with its easier operation

and more precise feedback control is also the company that listens: to its products and to You.

You asked for Rane reliability and Constant Q performance in a stereo 1/3-octave format, with precision calibrated 45mm sliders for better control resolution.

We give you the GE 60: • *With interpolating Constant Q filters, meaning you can achieve feedback control between ISO frequencies due to the narrow yet ripple-free combined response of two adjacent filters.* • *With sweepable high and low filters.* • *With Balanced 3-pin and 1/4" TRS and terminal strip input and output connectors.* • *With calibrated 45mm sliders featuring grounded center detents for flat response and low noise.* • *With UL Safety Agency approval for use in any venue.*



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We thought you'd be pleased. And so will your audience.

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Mukilteo, WA 98275
(206) 355-6000
Fax (206) 347-7757

P U R I T Y B Y D E S I G N™

Circle (104) On Reader Service Card

Commercial FM Opts For NPR

by Lynn Meadows

ROMNEY, W.Va. In this town, you can listen to "Morning Edition" and "All Things Considered" at 100.1 on your FM dial. That's right — a commercial station.

On Nov. 1, WJJB(FM) began airing the NPR news programs and "Car Talk." According to Kathy Scott, director of NPR communication, NPR's charter encourages the sale of programming to commercial stations when it is not available through a local affiliate station. WJJB serves a valley that West Virginia public radio does not reach.

Scott heard from several affiliate stations angry that the commercial station might be considered an "affiliate." Scott assured them WJJB is not an affiliate. If an NPR affiliate does move in, Scott said WJJB will have to stop broadcasting the programs.

Under the agreement, WJJB cannot air commercials during or around the programs and local underwriting cannot include a call to action. Like affiliate stations, WJJB had to agree it would not interrupt the NPR programs.

But unlike an affiliate, WJJB is paying an extra administrative fee to use the programming, said Scott. Also owner Warren Gregory said he intends to mix underwriting and traditional commercials into the station's regular smooth jazz format.

"It's an innovative approach that we think quite workable," he said.

World Radio History

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Ask USA Digital Radio DAB

•

Ask RCA DirecTV, LucasFilm and Top Recording Studios

We guarantee compatibility with MPEG II.
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COLE'S LAW

Congress Eyes Broadcast Auctions

by Harry Cole

WASHINGTON On the whole, broadcasters have had it pretty easy for a long time. After all, from day one they have been given the primary resource on which their business has been built — an exclusive federal license — pretty much for free. Oh sure, nitpickers may point out the application fees, the annual regulatory fees, the occasional fine or forfeiture. But by and large, the license has been a free ride.

Enjoy it while it lasts.

Despite the fact that many have thought that broadcasting has some kind of never-ending immunity against money-grubbing congressional types, it looks like the free ride may be approaching a toll plaza, perhaps not this year, but probably not too long after.

Ramifications

In a largely unheralded provision in the House Budget Reconciliation Act — a provision which first reared its ugly head in late October — the Commerce Committee proposed directing the commission to auction off new broadcast licenses. The proposal became part of the Budget Reconciliation Act that passed in the House. At this writing, the act is being debated in Conference Committee to reconcile differences between the House and Senate.

To be sure, the proposal may appear benign. It is limited to "initial license or construction permit" applications, which automatically takes existing licensees (and their existing licenses) off the table. The proposal also exempts frequencies for which competing applications have been accepted for filing by the commission prior to the enactment of the legislation (assuming it ever does get enacted). And it also exempts new applications for any "terrestrial digital television services" which might replace existing television licenses.

Given all those exceptions, you would think that the only licenses which might ever be subject to auction will be for new Class A stations in East Dumptruck, Wyo., or New Padiddle, Texas. Big deal, right?

Wrong. The problem with the proposal is not that we would all have to reach for our wallets right away. The problem is that this proposal provides the first very clear indication that the defenses against required payments for licenses, defenses which broadcasters have historically enjoyed, have been breached.

What this means is that, in its continuing hunt for ways to pay off the budget deficit (and thus claim to look good come election time), Congress has clearly picked up the scent of money coming from spectrum auctions. It would have been hard not to pick up that scent in light of the billions of dollars that poured in in connection with the PCS auctions earlier this year. But broadcasters have traditionally been able to distinguish themselves from common carrier/telephone types. After all, broadcasters provide "public service" without charge.

Unfortunately, that argument appears to be running out of steam, overtaken by the "notion that the radio spectrum is a bottomless drawer that can disgorge billions of dollars whenever the House Republican leadership runs short of cash" (to quote the minority views of a few dissenting members of the Commerce Committee). Those dissenters went on to suggest (sarcastically, we trust) that responsibility for federal telecommunications policy ought to be shifted from the FCC to the Bureau of Engraving and Printing.

Future trends

But what about all those exceptions and exemptions, you ask. Don't they give the universe of existing broadcasters some level of continuing protection? Maybe, but probably only for the time being. Once Congress gets used to the idea that any broadcast frequencies can be sold to the highest bidder, it will be hard for Congresses in future years to draw distinctions between brand new startup, low-watt stations in little markets, on the one hand, and well-established, high-power stations in big (and even semi-big) markets. And why should they draw such distinctions, when those high-power, big-city stations are worth exponentially more? If the name of the game (for Congress, at least) is raking in the bucks, why waste time with the East Dumptruck Class As of the world, worth maybe hundreds of thousands, when there are all those major market channels, worth maybe hundreds of millions, just begging to be auctioned?

With the passage of the Budget Reconciliation Act the camel's nose is in the tent and it will be hard to keep the rest of the beast out for very long.

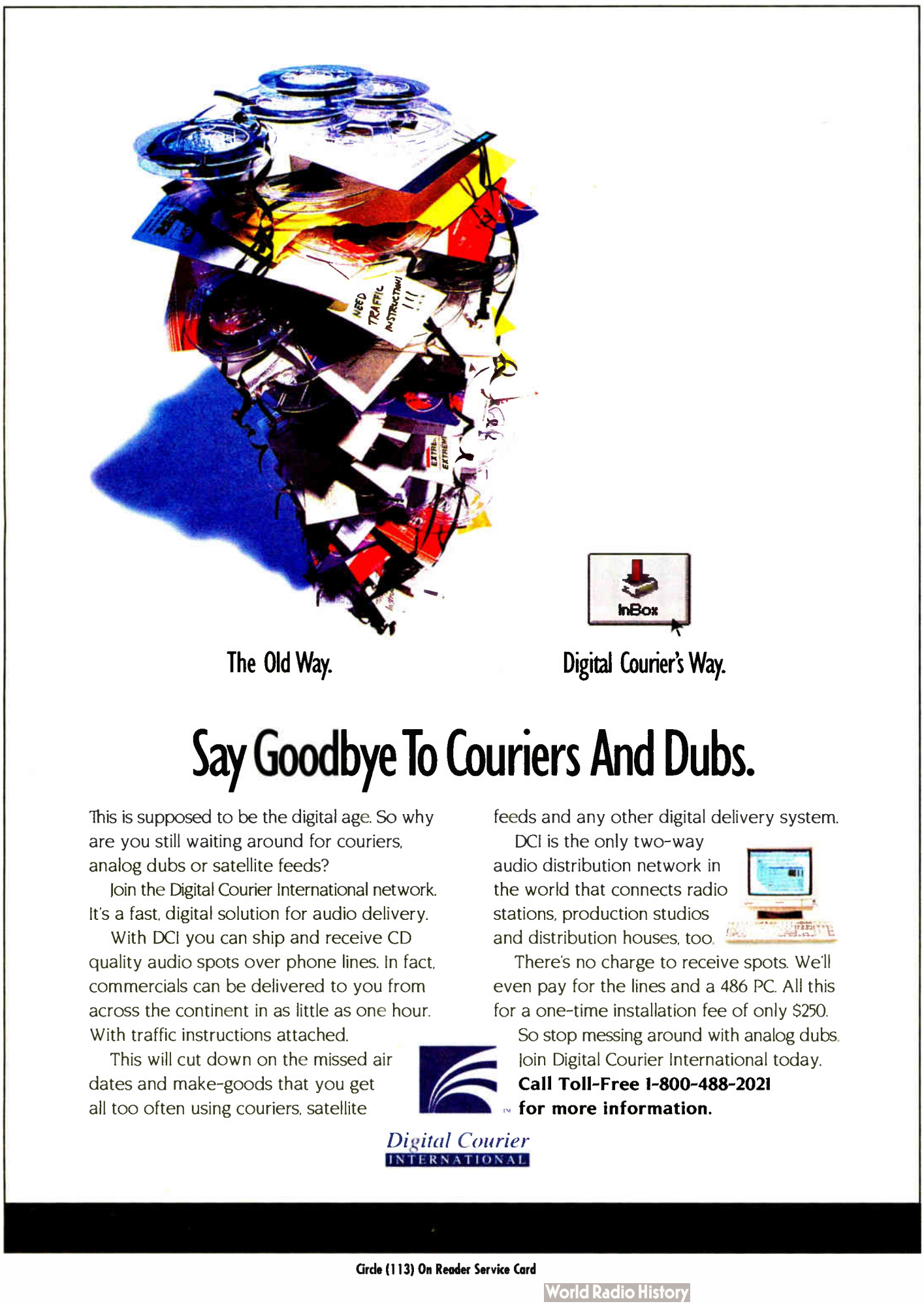
Of course, there are those who probably don't look at that prospect with fear and loathing. If you have vast coffers of cash and a big enough desire to grab frequencies without having to endure the pathetic charade of an FCC comparative renewal proceeding, then auctions are just your cup of tea.

But if you're just an average station owner you probably don't like the idea that, at some point, your livelihood could be put on the auction block, and you would be nothing more than an interested bidder.

If you have any questions about this, you should be sure to consult with your communications counsel.

□□□

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



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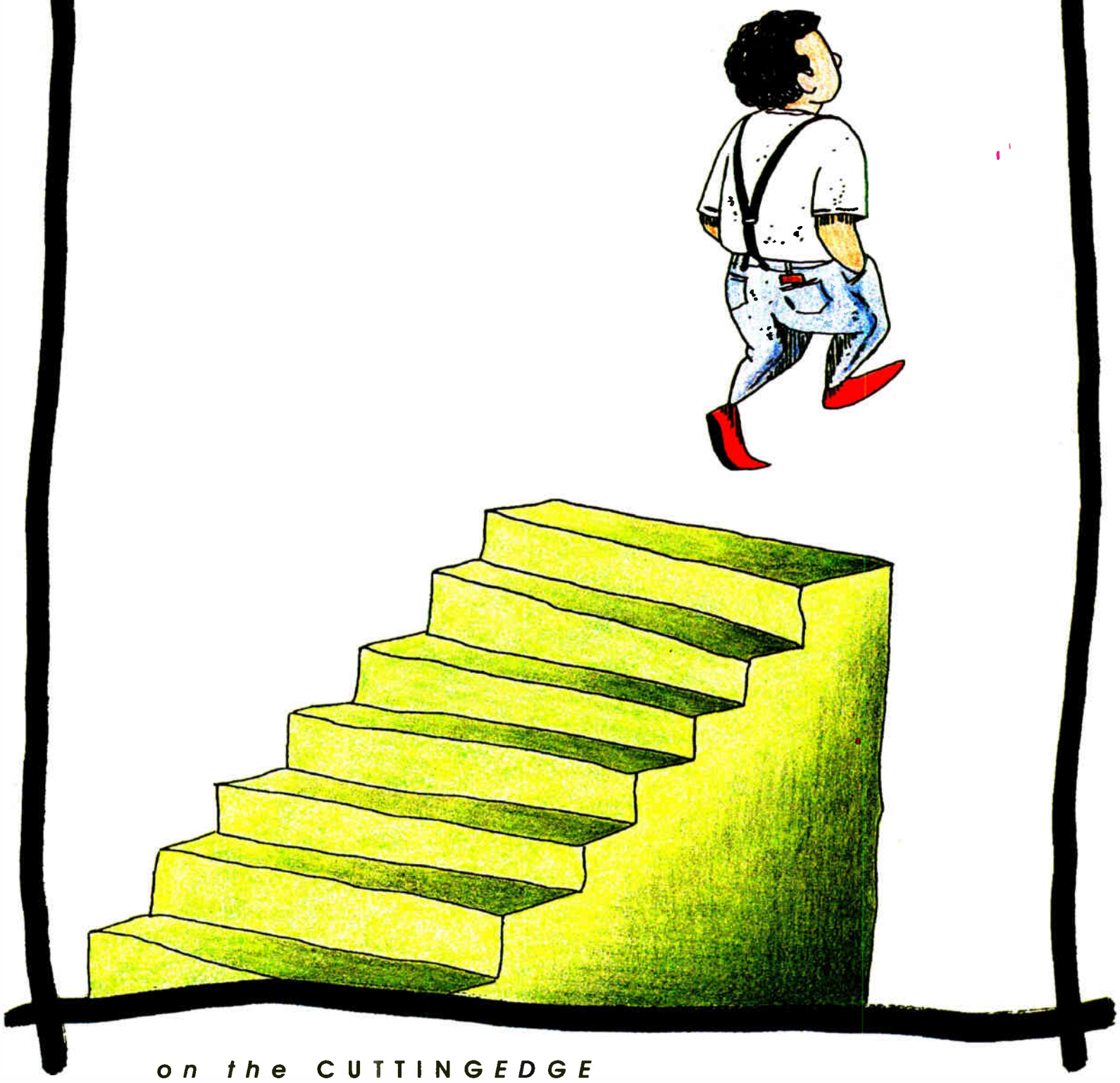

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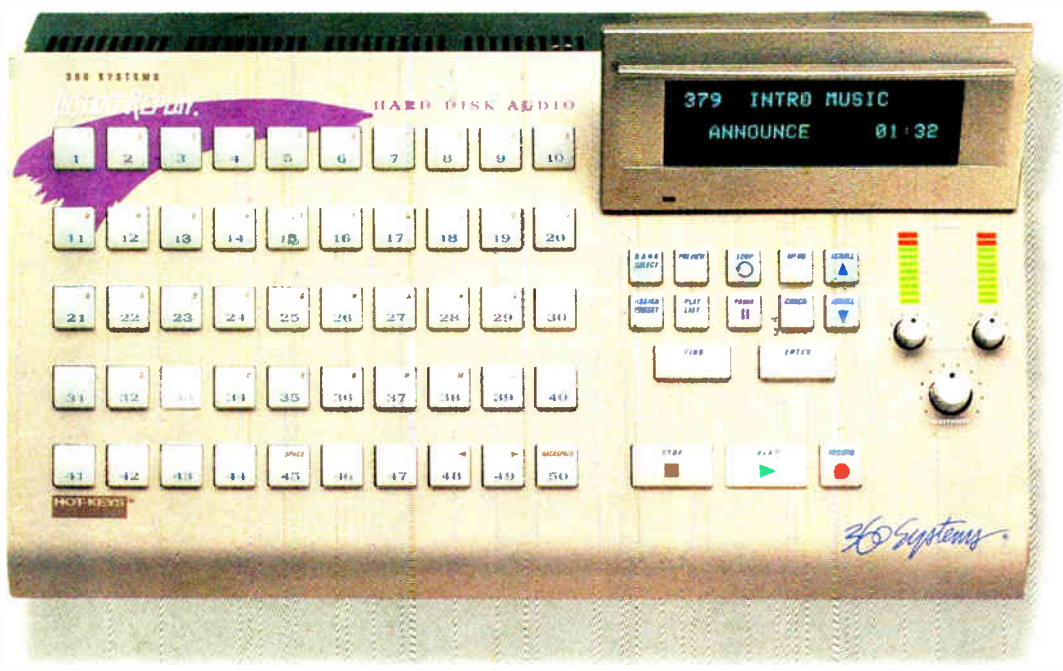

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World Radio History

WORKBENCH

Keeping Abreast of Software Options

by John Bisset

SPRINGFIELD, Va. So many engineers are now handling their station's computer systems, it makes sense to keep up on station software. If your station is presently leasing traffic and billing software, you may want to advise your management of the EXPRESSWAY traffic/billing package. Designed by a general manager to work on an IBM PC, the program is more powerful than some of the major leased packages, and simpler to operate. It uses 640KB of memory and a Windows version is coming.

One of the best features is its direct buy out price of $3,000. The EXPRESSWAY folks will let you use the software for 90 days free of charge. Two other features are appealing to the sales manager and the traffic manager. For sales, as dayparts sell out, you can pre-program an automatic rate increase to maximize profits. This feature can also be deleted.

As for the traffic bonus, ask your traffic manager how many times they have had a contract with no date/time affidavit required; and then at the end of the schedule, the client calls and says they need the affidavit for co-op. The usual scenario is for the traffic person to manually review the logs to flag the days and times. It is a real pain, because the process is so time consuming. With EXPRESSWAY, one key is hit, and the affidavit is printed — no more manual searching.

EXPRESSWAY has a descriptive data sheet that can be received by faxing your request to 703-764-0751; or for more information, circle **Reader Service 8**.

★ ★ ★

If you own a Telos Zephyr, and find that the unit doesn't want to remember SPIDS after the power has been turned off and back on, suspect a dead internal battery. My associate, Ed Bukont, encountered this problem recently. It turns out that the front panel display has some memory attributed to it. In order to save on the battery life, the unit puts the front panel to sleep when you turn the unit off.

If you disassemble the unit, and unplug the front panel, the memory gets wiped out. When you simply reconnect the front panel, the unit will become awake or active, even though the unit appears to be off, and the result is a quick drain of the memory battery.

If you do work on your Zephyr, once you reconnect the front panel, you need to immediately turn the unit on and back off again. This will recycle the system, and prevent the battery from being drained. If you have a bad battery, it can be replaced in the field, but you might want to return the unit to Telos.

Before you decide to disassemble the unit, look at the XLRs on the rear. If you are not familiar with the removal of this kind of locking XLR, do not try to disassemble the mother board, you will destroy the unit.

If you are into such involved disassembly, there is a neat mode that Ed came up with, and which you may want to consider. It will create a split IFB in the headphones. The completed modification involves feeding a headphone level signal through a modified rear quarter inch jack, so that the front panel jack gets a split feed — IFB in one ear, and local mix in the other.

As stated, this modification will require substantial disassembly of the unit. After having disassembled the unit, lift one side of R-52, which is one output of the internal headphone amplifier. This removes the internal right channel signal from both the front and rear jacks.

With the resistor lifted, a signal fed into the right channel (tip) of the rear jack will run directly to the right channel of the front panel jack (tip). As you have the foil side of the mother board facing you, note the quarter-inch rear panel jack. The front panel jack is connected to the mother board by a short jumper to the component side of the board, using a three-pin header. About two inches from the rear of the board, near the rear panel jack, are the three terminals used to feed the front panel headphone jack.

Looking at the foil side of the board, note a trace that makes a "T." One end of the T goes to R-53, and the other runs to the rear panel jack. The trace going to the rear panel jack is cut. By doing this, the internal headphone amp will feed receive audio (channel A), to the front panel jack only. This is typically used for the mix-minus/IFB from the station to the remote. Because the "tip" of the rear panel jack connects directly to the tip of the front panel jack, a signal inputted to the tip and sleeve of the rear panel jack will now be passed to the tip of the front panel jack. Such a signal should be a headphone level feed, typically from the output of a Shure M267 mixer headphone jack.

The headphone level is adjusted using the appropriate control on either the Zephyr or the mixer, depending upon which side of the headphones need adjustment. To complete the project, you will need to build a special patch cord to feed the signal into the rear jack. To accomplish this, and prevent destroying your Zephyr or other equipment, you must use two quarter-inch TRS plugs, and connect tip to tip and sleeve to sleeve with no connection to either ring. It is important that there be no connection to the rings of either plug. This patch cord runs from the external headphone level source to the rear panel jack of the Zephyr.

The split feed modification provides a producer's headset to be fed with IFB, which is separate from the talent or PA system feed, without the need of additional mixers or headphone amps. Of course, the Zephyr still provides channel A and B XRL outputs, as this modification does not change this feature.

□□□

John Bisset is a principal with Multiphase, a contract engineering firm based in Washington. He can be reached at 703-323-7180. Fax submissions for the Workbench column to 703-764-0751, or through America On Line at WRW-BENCH@AOL.COM. Printed submissions qualify for SBE Certification credit.

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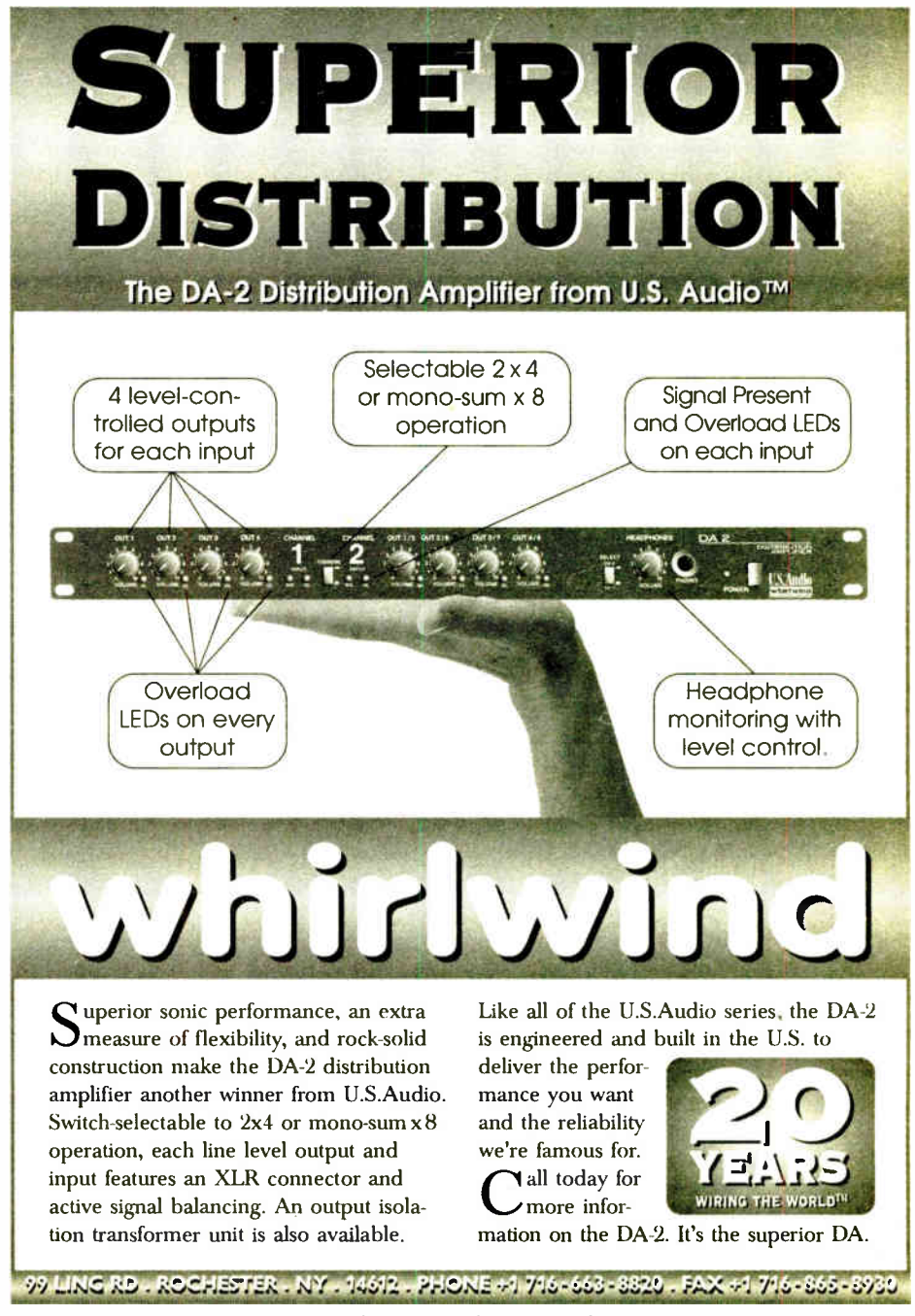

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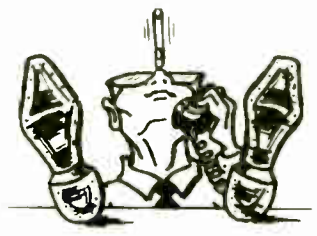

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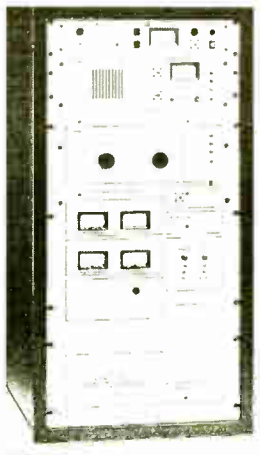

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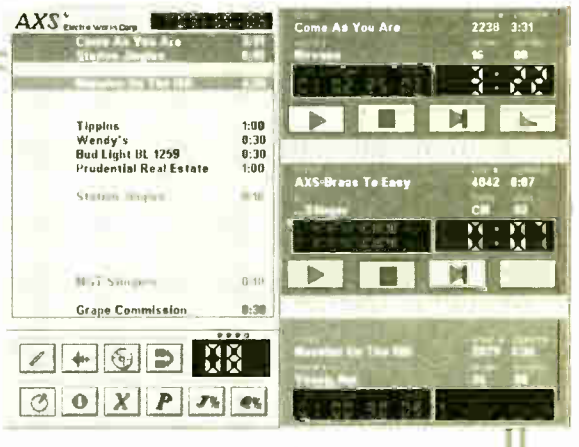

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World Radio History

Inside the 440e Microcontroller

by Jim Somich

Part II of III

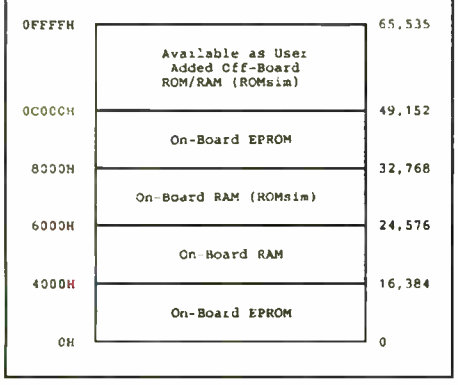
CLEVELAND Last month I introduced you to the Blue Earth Micro-440e microcontroller and discussed the basic architecture of the unit.

This month I will delve into the firmware structure of the 440e and look at its memory map and resident software.

In the final installment I will describe the role of the microcontroller in some practical radio studio applications.

The Micro-440e can access up to 64K of program (code) memory and 64K of external data memory. It contains 32K of EPROM, 16K of which occupies the first portion of the code memory address space. The Micro-440e also includes 32K of CMOS RAM which occupies the lower 32K of the external data memory address space.

Figure 1.



The second half of RAM is also accessed as program (code) memory. The upper and lower halves of the 32K RAM therefore operate differently. The upper 16K of external memory can be accessed by the processor as both code and data memory. This is known as Von Neumann architecture.

The lower 16K, however, is accessed as data memory only because code memory operations would access the 16K of firmware in EPROM.

In the standard configuration, only the first half (16K) of the EPROM is accessed by the CPU. The EPROM access jumper can configure the Micro-440e to access the second half of the EPROM for applications that require an additional 16K of code memory. The user may want to employ the Micro-440e's resident software to develop programs for dedicated applications around the station.

Once the debugging process is complete there may be no need to access the controller's resident software. With a user program loaded in EPROM memory the user can implement the entire 32K of on-board RAM in any way suitable to the particular application.

The 64K code memory address space in the standard configuration is mapped as shown in Figure 1.

The on-board EPROM is addressed as code between 0 and 16,383 (0-3FFF in hexadecimal code, or H) in the standard configuration and between 32,000 and 49,151 (8000H-0BFFFH) in extended mode.

The on-board external RAM is addressed as code between 16,384 and 32,767 (4000H-7FFFH). Addresses 24,576 (6000H) through 32,767 (7FFFH) can easily be write-protected to prevent the contents of code memory from being overwritten.

All code addresses between 49,152 and 65,535 (0C000H-FFFFH) will reference off-board external memory that must be implemented by the user.

There are a number of ways that the Micro-440e's code memory map can be altered. The controller can be configured so that on-board EPROM is accessed as code between 32,768 and 49,151 (8000H-0BFFFH). The user can also configure the controller through external circuitry so selected blocks of on-board RAM are not writable.

The 64K external data memory address space in the standard configuration is mapped as shown in Figure 2. This address space also includes read and write operations to the on-board analog-to-digital converter (A/D) and real time clock/calendar (RTC). Selected blocks of RAM may be write-protected using external circuitry.

The general function of each of the external data memory blocks is as follows:

The 0 to 511 block (000H-01FFH) is reserved for BASIC data storage. BASIC uses it for storing system parameters such as current crystal value and RAM size, as well as its argument and control stacks.

The 512 to 16,383 block (0200H-3FFFH) is mainly intended to be used by BASIC for storing user programs, variables and

continued on page 43 ▶

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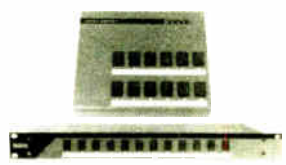

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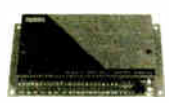

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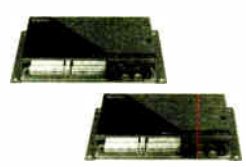

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World Radio History

Estimate Gear's Dynamic Range

Part II of III

by Jon Banks

ROCKVILLE, Md. This is the second of a three-part series about dynamic range. In this issue, we will talk about estimating the dynamic range of equipment by inspection and measurement.

To maximize the dynamic range of a system, we need to know the peak level and the noise level of each piece of equipment. We will align the peak levels so clipping occurs in each device simultaneously. We align peak levels instead of noise levels because noise levels are harder to determine, and they can change.

It is simple to measure the peak capability of each device, and that is really the safest thing to do. But because I'm lazy, I would rather determine it from the schematic.

Possible peaks

The peak level is dependent on the circuit configuration, active devices used, power supply voltages and load. Most modern equipment uses high quality op-amp devices and 15-volt bipolar supplies. If you remember basic op-amp circuits, it is easy to determine the possible peak levels.

Let us assume all the op-amps are 5532 or 5534 types, capable of driving a 600-ohm load almost to the power supply rails over the entire audio bandwidth. Other series, like the TL072 and the LF353 have similar voltage swing, but less load-driving capability. If you have op-amps you are unfamiliar with, check out the specifications. Never assume.

The maximum level sine wave output from a 5534 with a bipolar 15 volt power supply is:

30 volt peak-to-peak swing (almost)
Divided by two = 15 volts peak level
Multiplied by .707 = 10.605 volts RMS
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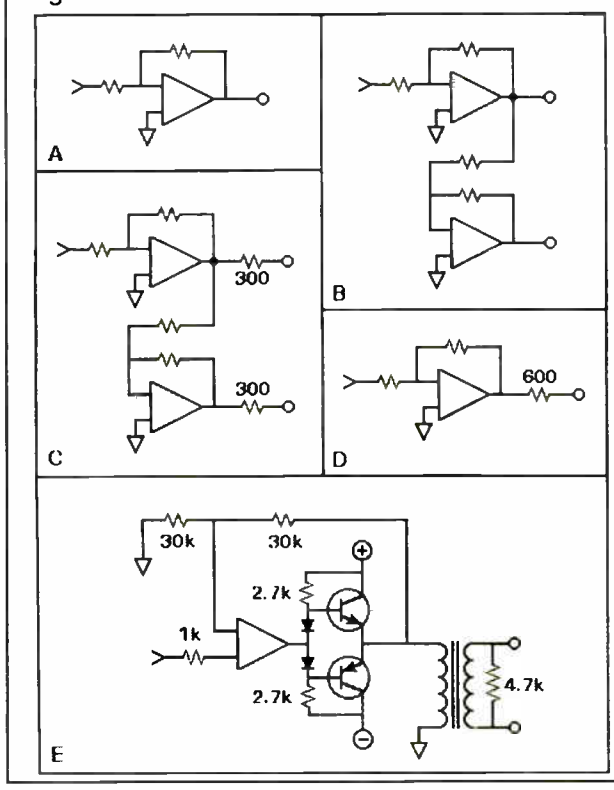
Figure 1.



The op-amp output cannot actually swing to the rails, but will max out right around +21 dBm. We can use +20 as our maximum level and still leave a little margin.

Most of the problems that reduce dynamic range occur at the input or output of a device. If the internal stages have reduced dynamic range, you will find out. The specs would show poor signal-to-noise ratio or a low maximum output level.

Figure 1 shows some typical output circuits. In Figure 1A, the maximum output sine wave is simply +20 dBm. In Figure 1B, the push-pull configuration doubles the voltage swing across the load, making the maximum level +26 dBm.

In Figures 1C and 1D, the series resistors will absorb half the output voltage if the device is loaded with 600 ohms. The circuit in 1C could output +14 dBm, and 1D could do +20. If these circuits are used to feed a high-impedance load, the voltage drop across the resistors will be negligible and the results would be the same as 1A and 1B.

Figure 1E is a little more complicated. The designer has incorporated a transformer to step up the output voltage so it is not limited by the power supply rails. We cannot calculate this one without knowing more about that transformer.

I adapted this circuit from a console output. It is actually good beyond +30 dBm.

Input circuitry

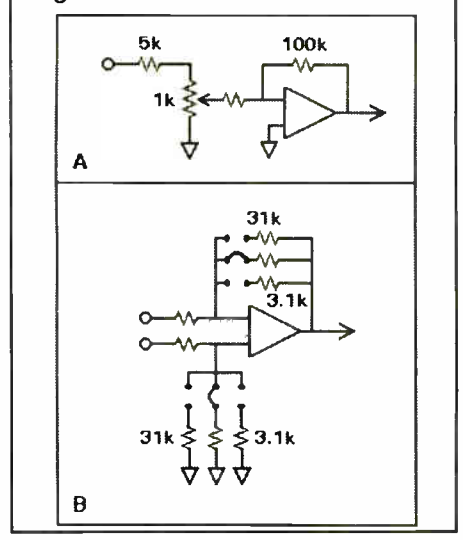
Two typical input circuits are shown in Figure 2. In 2A, the variable pad allows level control, and the first stage has 20 dB gain to make up the loss. Because the attenuator comes first, there is no maximum level at which the circuit will clip. However, if the signal is low enough to go through a 20 dB gain stage without clipping, it will pick up some noise.

In 2B, we can vary the gain by jumpering resistors. This is a better approach because we avoid the noise penalty.

There are some limits to our input level, though. As drawn, the gain is 0 dB; if the output is not to exceed clip level of +20 dB, the input must not exceed that either. Also, the voltage at the input pins of the op-amp must not exceed 15 volts. This is not usually a problem, unless you have a lot of common-mode noise.

Be aware that the input impedance and overload point of the positive and negative inputs is different. This might be a factor if you fed this circuit with a high-level unbalanced signal.

Figure 2.



Measurements

If you do not have the schematic, or are unable to determine the clipping point by inspection, you can measure it.

Assume the device has both input and output level controls. Connect a tone oscillator to the input, and an oscilloscope to the output. Do the measurement in circuit if possible; your measurements will not be valid if the unit normally works into a different load or circuit configuration.

Turn the output level control all the way up and the input control down. Apply a midband test tone at a level low enough to avoid overdriving the input, and begin turning the input control up. By keeping the input low, we will try to make sure the output hits clipping first. When you see clipping on the oscilloscope, you have found the maximum output level. Back the audio off just shy of clipping, and note the level at the output.

To find the maximum input level, turn the input control up and the output control down very low. Increase the tone level until you get clipping. If the clipping stops when you back off the input level control, your circuit probably has an attenuator stage first. Then there would be no absolute limit on the input levels. If not, reduce the oscillator level below clipping, and measure the level. That is the maximum input level.

If you can, put the unit back on line, adjust the input and output to their normal positions and check that the clipping levels are not affected. Also, measure the absolute noise level at the output. This may be affected if the input or output controls are being operated at the end of their range.

Next issue, we will look at aligning the dynamic range of an entire audio chain.

□□□

Jon Banks is chief engineer of WARW-FM, Rockville, Md.; the CBS O&O station in Washington. His new hobby is changing diapers.

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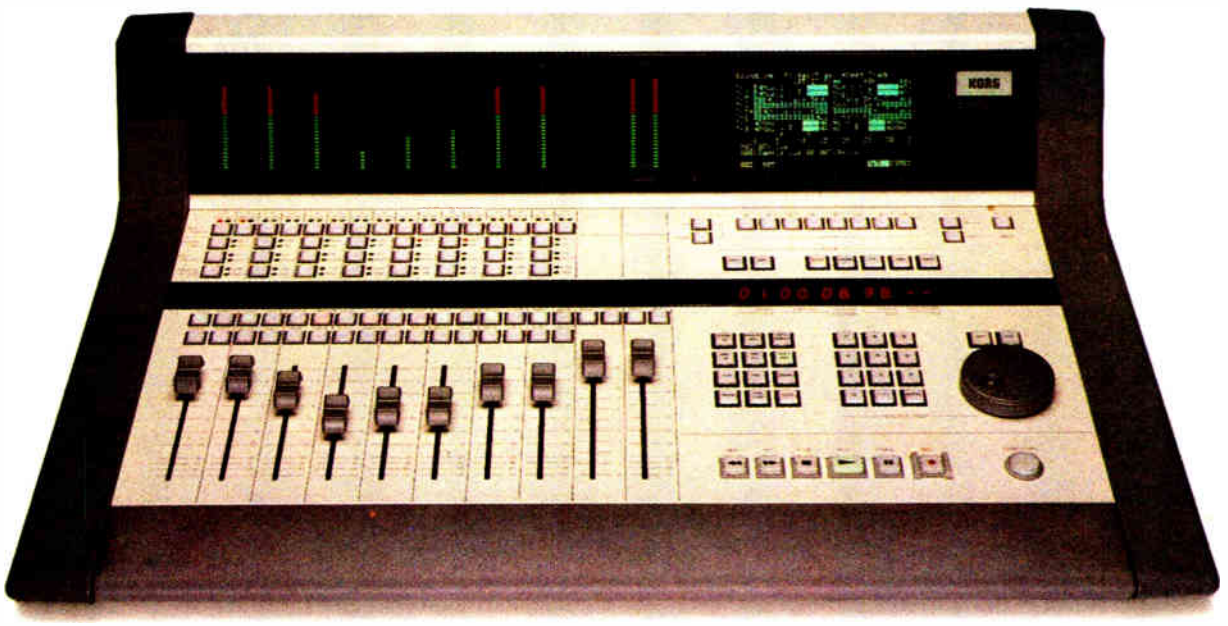

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Circle (126) On Reader Service Card

World Radio History

Studio Sessions

Equipment and Applications for Radio Production and Recording

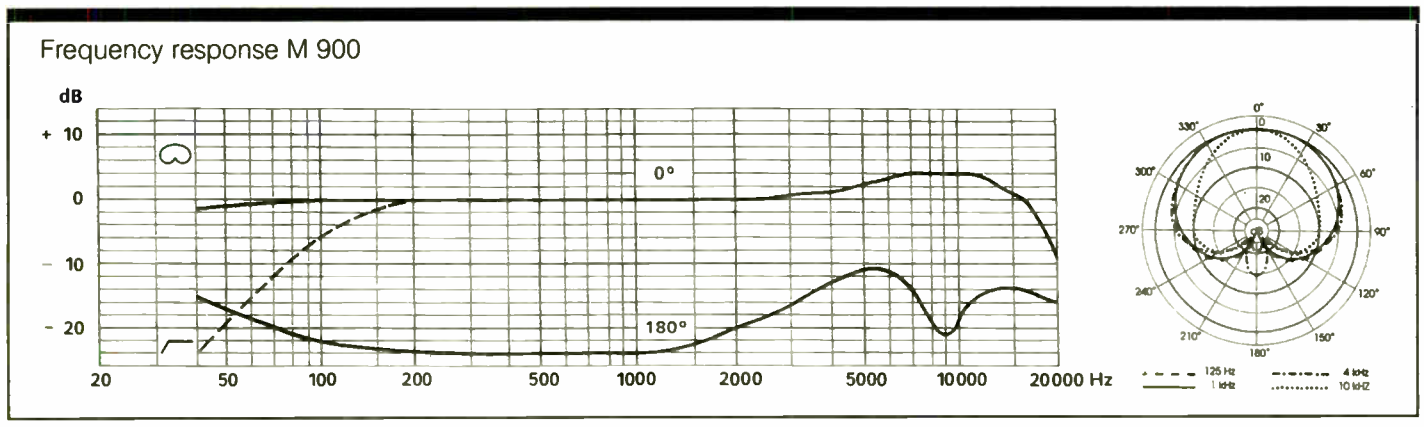
Product Evaluation: Fast Eddie
See page 29

PRODUCER'S FILE

New Mic from Microtech Gefell

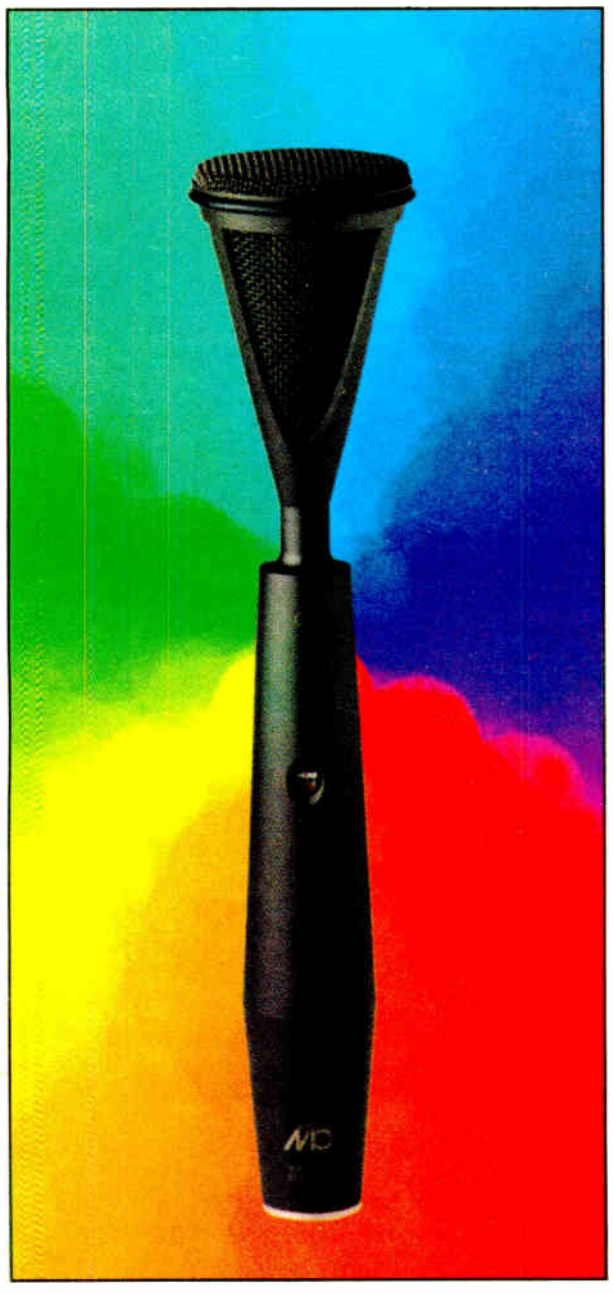
by Ty Ford

BALTIMORE It is hard to imagine a more exotic looking mic than the Microtech Gefell M 900 ($995). The cardioid condenser M 900 and hypercardioid cousin, the M 910, resemble ray guns.



The M 900 is a transformerless large-diaphragm condenser microphone with a single cardioid pattern. The membrane is a standard one-inch gold-sputtered Mylar membrane. The capsule was designed and computer-modeled at NIKFI in Moscow.

According to GPrime, the U.S. distributors, it has a ceramic backplate that is more stable under temperature changes than the often-used brass. The conductive side is chrome-plated.


Microtech Gefell M 900

Over that is evaporated a one-micron coating of Teflon. The Teflon acts as an insulator between the membrane and backplate and prevents damage as a result of incidental contact between the two.

Frequency response is quoted as 40 Hz to 18 kHz. Sensitivity of the M 900 is 17mV/Pa. Due to the tighter pattern of the hypercardioid M 910 version, sensitivity is slightly less at 14mV/Pa. Sensitivity is measured as the ratio of the acoustical input to the electrical output.

The M 900's active transformerless output removes the limitation on the output capability that would be imposed by a transformer.

Inside circuitry

The MV200 amplifier (impedance converter) inside the M 900 converts the large capacitive impedance of the capsule down to about 150 ohms.

The electronics also contain a switching power supply to generate the polarization voltage for the capsule, which is independent of the phantom voltage. This allows the mic to have a higher polarization voltage than the phantom voltage.

A higher polarization voltage results in enhanced sensitivity and lower self-noise.

For compactness and mechanical robustness, all components of the MV200 amplifier are zero-clearance surface mounted (SMD) on the board.

Then of course, there is that shape. There will be no mistaking this mic for a Neumann clone anytime soon.

My benchmark comparison mics are the ubiquitous U87 Neumann and AKG C414. These, along with the M 900, were routed through A.P.I. mic preamps at Flite Three studios in Baltimore. I observed the following similarities and differences.

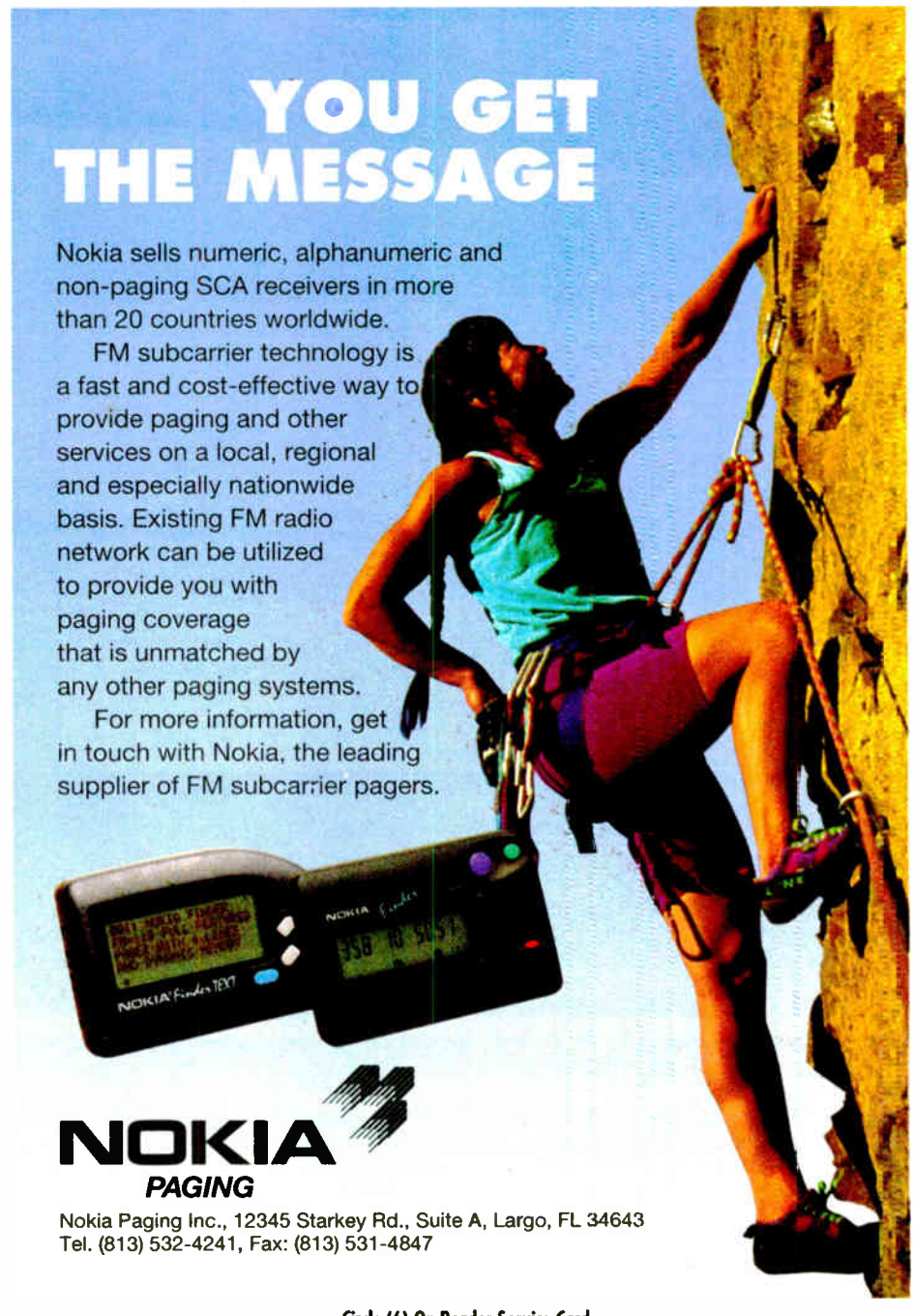
The M 900 is at least as quiet as a U87 (not the U87ai), with a slightly higher output. The M 900 is much warmer than the U87, especially at a working distance of less than four inches. Due to the proximity effect and the mild sensitivity to popping, the closest I would position the mic for voice work would be four inches.

Getting any cozier to the mic than that would make the bottom overwhelm the complete signal, unless the voice or sound is thin to begin with.

The M 900 loses proximity fast. At a distance of eight inches, it is only slightly warmer than a U87. Back off to about a foot, and the bottoms are almost the same. While each mic has a peak, the M 900 has a brighter top, with a peak somewhere in the 7 kHz to 9 kHz range versus the 3 kHz to 5 kHz peak of the Neumann U87.

Matched up against the AKG, the M 900's bottom is similar, but slightly

continued on page 35 ▶



Circle (6) On Reader Service Card

World Radio History

Song Parody Easier Than You Think

by Alan R. Peterson

Author's note: This article addresses the technical aspects of vocal elimination, not the legal ones.

Parody is protected as free speech. Still, you are responsible for permission and licensing to market your creation beyond your station's single play — even for the sale of one cassette copy. When you profit from somebody else's music, mechanical and performance rights are at issue.

Contact ASCAP, BMI or the publisher and do it the right way.

WASHINGTON Song parody writers have always had a home on radio. The creation of humorous topical songs has spawned a mini-industry of comedy song services and performers.

How to do it

The efforts of Bob Rivers at KISW-FM, Seattle resulted in albums such as "Twisted Christmas." Companies such as American Comedy Service and Premiere Networks create parodies for morning radio shows that normally would not have the resources to do so themselves.

Fortunately, you do not require a recording studio or session musicians. Some very good and funny pieces can be done simply by applying vocal removal techniques to the original stereo recordings.

With the exception of hard-panned Beatle records, stereo recordings have instrument tracks placed around the stereo spread. Lead vocals normally have equal amounts of left and right information, placing the sound in a perceived "center channel." When both channels are summed to mono (L+R), the balance remains reasonably intact.

However, by reversing the phase of one channel and summing to mono, a Left-minus-Right (L-R) condition is created, canceling out all common-mode signals on the recording. The result is the suppression of the lead singer, the bass guitar and perhaps some drums.

Why the extra cancellations? Drums are mixed to emulate the placement of the drumkit in space. Vinyl recordings originally had bass mixed center-channel to avoid knocking the stylus out of the groove. This practice persists on many of today's CDs.

The resulting mono mix will sound a little hollow compared to the original recording, but a dash of EQ can compensate for some of the lost bottom.

Not every recording can be successfully canceled. Sibilance, reverb and off-center vocals will most likely remain. Main vocals, however, will be suppressed to the point where new lyrics can go nicely on top of the track.

Many 1970s-vintage stereo vinyl records are good "zapping" candidates, as are most modern CDs. Cassettes are more temperamental.

There are many ways to perform a singer-ectomy. In every instance, the console must be able to mix to mono.

Multitrack production boards are best for this purpose, because most Tape Return and Mono channel faders have phase reversal switches.

Record stereo audio to tape or hard disk. On playback, flop the phase on one Return fader, sum to mono and direct to a new track. This becomes the mix with no lead vocals.

In stock two-track rooms, physically reverse one pair of leads on the turntable phono cartridge. This changes phase right at the source. Be careful, as these wires are quite fragile and do not appreciate lots of handling. A better solution is the DPDT switch before the preamp shown in Figure 1.

CD players cannot normally reverse phase, but it is possible to hang a black-box with a unity-gain inverting op-amp circuit and DPDT bypass switch on the output of one channel. Again, the stereo signal must be summed to mono at the console.

Figure 2 shows a bare-bones inverting op-amp circuit. Refer to *Pocket Protector* in the May 3 **RW** for the right way to do it.

A number of consoles with multiple input selectors can accommodate a permanently hard-wired out-phase source. Vocal elimination becomes a simple matter of wiring one input channel in reverse.

Simple switching

Tom Osenkowsky (CPBE) of Brookfield, Conn., created a clever "brute force" circuit for the production rooms of WLAD-AM/WDAQ-FM, Danbury, Conn.

The passive circuit shown in Figure 3 consists of four isolation resistors built onto a 4PDT rotary switch, wired between the studio's Otari 5050B tape deck and Harris "Medalist" console.

The switch solves a double problem by simultaneously flopping the phase and mixing to mono. Users can select either normal Stereo or L-R mode for vocal elimination. The circuit is slightly lossy, but can be compensated for by recording the mono mix at a hotter input setting.

Commercial products for removing vocals are available. A number of digital multi-effect processors can null out common-mode information, as can the Vocal Zapper from PAIA Electronics, Edmond, Okla. and the Thompson Vocal Eliminator from LT Sound, Lithonia, Ga.

All you need now is inspiration, and a hit parody is born.

□□□

For product information on vocal eliminators, contact PAIA Electronics at 405-340-6300. LT Sound can be reached at 404-482-4189.

Figure 1.

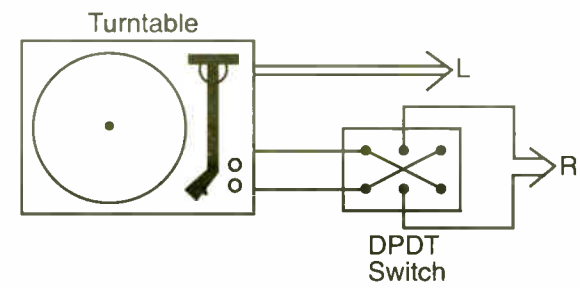


Figure 2.

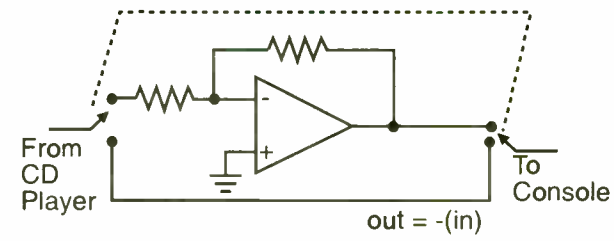
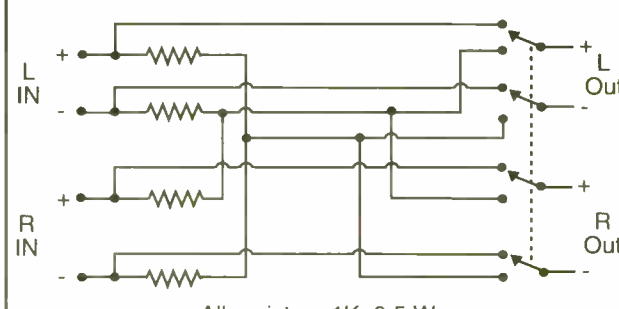


Figure 3.



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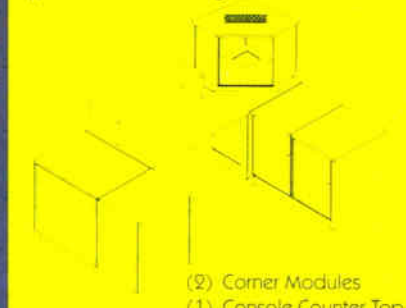

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World Radio History

Clean & Restore Old Analog Tapes

by Rich Rarey

WASHINGTON Ever since I told you how to "Bake the Flakes Back into the Tape" (Oct. 4, **RW**), I have received some engaging e-mail from several readers.

In the original column, I asked experts why tapes lose their oxide layer and how to restore such reels to a playable condition. The column prompted some very worthwhile questions.

Greg Guarno e-mailed to ask:

"What are the audible effects of 'baking' tapes? I have heard it dramatically increases print-through, and that it may erase some of the high frequencies.

"Are Ampex and 3M now using different binder chemicals? If so, have they held up any better?"

Young tapes

Guarno wrote that he has been dealing with this problem for many years, and it seems he has encountered this sort of shedding on tapes that are only four or five years old.

This would mean that the tape was manufactured after the symptoms were already known, suggesting that companies continued making defective tape for some time.

"I should add that tapes from the '50s and '60s do not seem to exhibit this shedding," Guarno wrote.

I posed these questions to our two tape experts: William Lund, senior technical service engineer at 3M, and Tom Neuman, senior staff engineer in charge of the Recording Technology Group at Ampex.

Both experts said baking tapes at the prescribed temperatures will have no apparent audible effects. Neuman said a temperature of 120 F does not affect lubricants or other additives and does not destroy splices, plastic reels or leader materials. He said he has not noticed any adverse effects in the 2,000 tapes he has personally baked.

Lund said high frequencies do reside nearest the actual surface of the tape, but unless that surface is disturbed in some way, the baking process does not change the magnetic properties of the oxide particles which make up the magnetic coating of the tape.

In Neuman's opinion, the only risk during baking would come from stray magnetic fields inside the oven. These fields are generated by electric fan motors, heating elements or solenoid coils. It is a good idea to check for any such stray fields before baking a tape in an unknown oven.

Unwanted transfer

Print-through, according to my old Audio Cyclopedia, is the "unwanted transfer of a signal from one layer of tape to another by magnetic induction." According to Lund, the print-through phenomenon is not well-understood and very elusive to quantify.

He said it is a characteristic of the oxide used and how it is prepared for use in the chemical binder of the tape. Interestingly, print-through reaches a "terminal value" after a period of time. That is, the tape will achieve the most print-through it can have, and the amount will not increase thereafter.

The time it takes for a tape to reach this value depends on the tape, the oxide used on it and the storage temperature. Lund said the oxide and tape are pretty much fixed, making temperature the biggest variable.

A tape stored at a very low temperature will take considerable time to reach its terminal value for print-through, whereas a tape stored at high temperatures will achieve its terminal value much quicker.

The terminal value is the same in both cases. It simply takes much longer to get there at low temperatures. He advised not to worry about the baking process and its potential for causing harm to the valuable tapes, because it does not happen.

Better binders

What are Ampex and 3M doing differently? According to Neuman, the sticky shedding syndrome was first noted and the effect fully understood about nine years ago. At that time, all tape manufacturers began the process to improve the tape's archival stability.

The binder problem did not appear until seven or eight years after introduction of the product. Because the predictions did not show the problem at all, Lund said, "it hit us as a real surprise."

Neuman pointed out an interesting aspect of a particular product's age: manufacturers have no control over the age of tapes sold by the supply houses. A reel purchased five years ago could actually be eight to 10 years old.

Neuman recommends buying tape stock from well-known, reputable distributors.

So with all the excitement over binders becoming unbound, what is keeping the tape companies from returning to old tried-and-true formulations that worked so well?

3M's Bill Lund said that in the quest for tapes with higher output, lower noise and lower print-through, different oxide technologies were required. The modern, better-performing oxide formulas are chemically incompatible with the older binders from 40 years ago.

Consequently, if manufacturers were to return to those old binder compositions, we would see a return of tape stocks with unacceptable degrees of print-through, lower maximum output and bias noise floors inferior to the tapes we use today.

Fungus among us

Another reader, Charlie Mayer at Swarthmore College, wrote asking what to do with archival tape that is growing yellow, green and white mold (clearly not his school's colors).

Ampex's Tom Neuman provided this ready recipe for restoration.

First, open all affected boxes and remove the reels. Next, place the opened boxes and tapes in a dry, warm room so the tapes can thoroughly dry. This may take anywhere from a few days to a couple of weeks.

Warning: do not bake tapes that have mold growth as this will just bake the mold into the tape and permanently stain the surface of the tape.

After the tapes are thoroughly dry, remove the flanges (if the tape is on metal reels) and thoroughly clean the mold off with a three-percent solution of hydrogen peroxide. This can be purchased at any drug store.

Hydrogen peroxide is the only solution recommended by Neuman for cleaning

the surface or backcoat of a tape. It does not damage any of the tape's chemical components and is safe to the user. By all means do not use alcohol or other solvents as they may permanently damage the tape.

Peroxide will effectively clean off the mold and its antiseptic properties will help inhibit future mold growth.

Labels that are stuck onto the flanges seem to be great breeding grounds for mold, so it is especially important to clean these thoroughly.

Now comes the tedious part. Replace the flanges if necessary, load the reel of tape on a transport and slowly wind the tape forward by hand, inspecting the surface for signs of mold.

If any is seen, wipe it off with the peroxide solution and a TexWipe or similar lint-free cloth. Follow by wiping the excess liquid off with a dry wipe.

Pay particular attention to the edges of the tape as this is where growth generally starts. The time this procedure takes depends on the severity of the mold growth and especially on your patience threshold.

If the entire tape is affected, dampen a cloth slightly with the peroxide solution. Hold it against both sides of the tape while it is running at the slowest speed you have available. If you use this method, repeat the process several times with a dry wipe to completely dry off the tape's surface.

Ready for storage

In many cases the surface of the tape may be stained from the mold even after cleaning. This is merely a cosmetic problem, not a functional one.

Prepare to put the tape back in storage. Thoroughly clean the storage box with peroxide and let it dry completely. Quite often the box will be considerably damaged and a new box may be needed. In the case of historical material, the original box may need to be cleaned and stored separately from the tape.

Mold growth usually originates from moisture trapped in the box material or inside the box.

Before putting your tapes back into long-term storage, make sure there is no trapped moisture in the box. As Neuman said, "It is not a good idea to put tapes away when the humidity and temperature are high, as this is the air that will be trapped inside the box for the next 20 years."

Neuman said he has personally cleaned dozens of tapes using this method and it seems to work quite well.

Rich Rarey is the Technical Director for National Public Radio's All Things Considered, and can be reached at rrarey@npr.org

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World Radio History

PRODUCT EVALUATION

Digital Audio Made Easy with Fast Eddie

by Read G. Burgan

DETROIT Do you still think digital audio is too expensive? Too complicated to learn? Are you really that happy with analog equipment?

Digital technology lets you produce complicated spots in less than an hour, splice tracks as fast as you can blink your eyes and allows fourth and fifth generation copies with no perceivable increase in noise or distortion. Try that with your edit block and razor blade.

But what about expense? I have just spent the last few weeks using Fast Eddie from Digital Audio Labs. This is a very inexpensive software package, with a street price of about $99.

Fast Eddie's two-part main window provides easy editing.

Do not expect full-featured digital audio software at this price. It lacks the bells and whistles of more expensive bundles, but is a fine way to get started in digital audio without mortgaging the farm.

Fast Eddie has all of the basic tools needed to carry out most production work done in the average radio station. Best of all, Fast Eddie is easy to learn, with a superb manual that walks even the most uninitiated novice through the process. With the tutorial in the reference guide, I was able to produce a basic promo from scratch in less than 30 minutes.

Technical information

Digital Audio Labs was founded in 1988 by Al Pickard and Jeff Wilson to build the first CD-quality digitizing card for the PC platform. Their efforts resulted in CardD Plus, the I/O CardD, and the Digital Only CardD.

Fast Eddie was developed in 1990 through the combined efforts of Jeff Wilson and Minnetonka Software's John Schur.

Fast Eddie requires a 386DX/40 computer with a minimum 4MB RAM, Windows 3.1, a compatible soundcard and hard drive with adequate capacity for large digital audio files. I installed Fast Eddie on a 486DX/50 computer with 16MB RAM, a Turtle Beach Montery soundcard and a 1GB SCSI hard drive.

At the 44.1 kHz sampling rate, a one-minute stereo sound file can occupy up to 11MB. At 22.05 kHz, the requirement is nearly half. Record in mono and the times are halved again.

The operating files for Fast Eddie require less than 1MB of disk space. If you install the tutorial files, you will need an additional 5MB or so more.

It is worth doing so, as the tutorial is well-written and is probably the best way to get up to speed on Fast Eddie's main features. You can always load the tutorial at the start, then delete the files later.

Fast Eddie's approach is different from most standard digital audio products. Perhaps an analogy from the not-so-good-old days will explain the difference.

At one time, production was done by recording a music bed on one tape machine, narration on a second deck and sound effects on a third.

You would then rehearse this three-machine mix to work out timing and levels. Finally, the three machines would mix down to a fourth. If you were lucky, you got it all in one take. In most cases you ended up redoing the process repeatedly, recuing the machines and resetting levels each time. It worked, but it was definitely a pain.

Then multitrack machines became affordable for even the smallest stations and studios. You simply laid tracks down one at a time in proper synchronization with each other. Recuing was a thing of the past.

No problem with levels either. They could be adjusted during final mixdown, along with EQ and other changes you wanted to make.

While many digital audio packages use this multitrack approach, Fast Eddie behaves more like the old method where a separate machine accommodates each track and everything is

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LINE-OUT

Capturing the Magic of The Grand Piano on Tape

by Bruce Bartlett with Jenny Bartlett

ELKHART, Ind. A beautiful instrument like the grand piano is a challenge to accurately capture when recording for broadcast.

The goal is to record the piano so it sounds the way it would from the perspective of the audience. To do this, you need to position the mics several feet away from the instrument. Five to 20 feet is the recommended distance.

First you need a good-sounding room to record in. Your first choice should be a recital hall or quiet church with a reverb time of one to 1.5 seconds.

Equipment for recording the piano is simple:

- a stereo mic or two matched mics
- mic cables
- one or two mic stands with extensions
- stereo bar (to support two mics)
- mic preamps or a high-quality small mixer
- DAT recorder and DAT tape
- headphones or amplified speakers
- pen, notebook, outlet strip, gaffer's tape.

For best sound, use condenser mics with low noise and a flat, wide-range response.

Setting up

Begin by placing the piano on stage about 12 feet from the edge. Pianos often have two prop sticks to hold the lid open. Raise the lid on the long stick, and aim the open end at the audience. Have the piano tuned.

Set up your mixer where you can clearly monitor the mics. Ideally, this would be in a separate room.

Mount your stereo mic — or two mics on a stereo bar — on a mic-stand extension boom. Shockmounts are a good idea.

Place the mic stand 12 feet from the piano, with the mics aiming down at the piano strings. Run mic cables and plug them into the mics. Raise the mics so that they are even with the raised lid. This is important as it prevents lid reflections and the audible colorations they cause.

If you are recording a piano concerto with an orchestra, the mic placement will be very different. The piano mic should be about one to three feet away to reduce leakage.

Techniques

You have several choices of stereo mic techniques. If the recording must be mono-compatible, use an M-S or X-Y pair.

For sharp imaging and spaciousness, try an M-S stereo mic or a SASS stereo mic.

Also consider the ORTF method. It uses two cardioids angled 110 degrees apart and spaced seven inches horizontally. You might also try a pair of boundary mics on a V-shaped wedge made of two-foot, square plexiglass panels.

For a warm sense of ambience, use two omnidirectional mics about 18 inches apart.

Before you start recording, turn off the air conditioning to reduce background noise. Make sure the left and right channels are not reversed.

If you are recording for CD release, set your DAT sampling rate to 44.1 kHz. Any other rate will require sample conversion and should be avoided.

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World Radio History

Is Radio Still Training Its Young Stars?

by Alan R. Peterson

WASHINGTON My first station has been sold.

I recently read of the sale of WSGO(AM)-WGES(FM), Oswego, N.Y., where I had my very first professional radio job — and felt a little pang of regret.

Oswego is a small city on the edge of Lake Ontario. In earlier days it was the bustling "Port City" of central New York. Barges would travel through the Erie canal system, turn north at Syracuse and head up the Oswego River to the Great Lakes.

The barges are long gone and the city today is best known for a State University of New York campus and for its snow.

In the winter of 1979, this know-it-all hotshot from Long Island, N.Y., travelled to this wilderness in search of that first radio gig. Stations within 25 miles endured my horribly lame tape and embarrassingly scant resumé. I had no phone, so there was no way I could be contacted.

First contact

Bob Gessner found a way. He was the owner and general manager of WSGO-AM-FM; a daytimer at 1440 kHz and Class A at 105.5 MHz, simulcasting a full service adult contemporary format.

One afternoon I found his business card tacked to the door of my cheap apartment. "Please call for an appointment ASAP," was on the back of the card. I called him from a pay phone at the sandwich shop downstairs, breathless in anticipation of my first big break.

The studios were in a converted mobile home-type facility under the tower, a few hundred yards from the shore of Lake Ontario; 40 percent of our signal went to the trout.

An abandoned toxic chemical dumpsite was next door to the station. Three nuclear reactors were a short drive up the road.

I took the job anyway.

Bob wisely started me out where I could do the least damage: weekends. Saturday I ran a live countdown show and Sunday it was the religious reels.

Bob took a chance and moved me full time into sales. Big mistake. I was a stunningly bad salesman. As it turned out, our night jock was itching to be an account executive, so we simply switched positions and both prospered along our own ways.

Reality sets in

WSGO taught me that being a jock was more than crummy jokes and good records. An air talent has to be intimately tuned in to the community, a fountainhead of important facts and figures, a celebrity softball player, a Mutual satellite dish-builder, trivia genius and everything in between.

Bob patiently let me make all the obligatory stupid mistakes: records on wrong speeds, outdated holiday spots and mangled pronunciations of landmarks and prominent local people. After a painful eternity, I got it right.

In two years I worked my way from nights to afternoons and finally to programming and mornings (all shifts were six hours long). I made good on my big break, but by late summer 1981, it was clearly time to move on.

Through the '80s as the jobs got better, I tried to keep up on news from WSGO. The AM went nostalgia, the FM adopted a personality adult format. The last time I heard either station was in 1989 while doing afternoons on WHEN(AM), Syracuse.

Sentimental journey

While recently visiting SBE chapter 22 in New York state, I took a sidetrip to call on my old station.

It had been moved from the highly-toxic site and relocated to a former cornfield on the highway out of town (how fitting it would have been to broadcast my show from a cornfield).

Much of the gear showed scratches that were very distinctly mine from 16 years prior. The AM played a homebrew big band tape format sequenced by an old thumbwheel programmer. The FM was now WGES and was on the bird after AM drive.

Best of all, Bob was still there, stopping his desk work every few minutes to run back and play spots when the network called a stopset.

Good timing

He told me the time was right for his getting out, and I understood why. Satellites ... duopolies ... expenses ... small market radio just was not fun anymore. He sold his stations to another New York broadcaster and was looking forward to stepping back and relaxing for awhile.

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World Radio History

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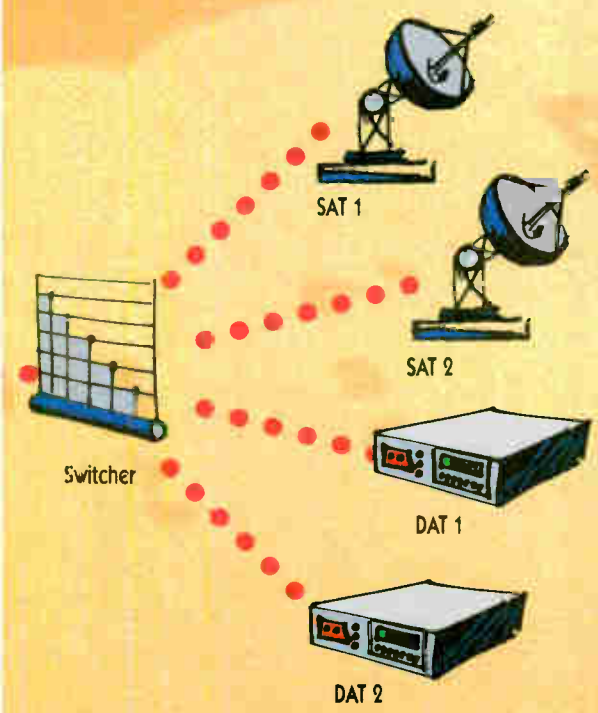

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World Radio History

Recording the Piano

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Now you are ready to set levels. Put the mixer faders at design center, which will be the shaded portion, or about two-thirds fader length.

Have the pianist play several triple-forte (extremely loud) chords. Set the mixer input trimmer controls to get a 0 level on the mixer meters. Then set the DAT record level so the meters read -3 dB maximum. That way you will have a little headroom in case the musician plays louder during the session.

Next you will check the mic placement. Record a minute or so of music and play it back to yourself and the pianist.

Does the playback sound dry without any room ambience? Move the mics a foot or two farther away and record again. You may need to move the mics offstage and raise the stand to obtain the necessary distance.

Sweet spot

Is the sound too distant and muddy? Move the mics a little closer and re-record. Eventually a "sweet spot" will reveal itself where the piano blends well with the hall acoustics.

Does the piano sound too dull or too bright? Try another mic or add EQ. If you need more clarity, boost a few dB around 10 kHz. Boost a little around 60 Hz for more bottom.

When everything is right, begin recording. Do not touch any controls during the session. If you do, sections edited together after the session will not match in tone or level.

Because the recorded performance must be perfect, the pianist might do dozens of takes and edit together the best ones. Have the performer announce the take number. In your notebook, write down the take number and its DAT counter time.

Let us describe a typical session with a pianist we will call Kathleen. She announces "take one" and plays until she makes a mistake.

The tape keeps rolling. Kathleen says "take two," and starts playing from just before where she left off. She plays until she makes another mistake. Then she announces the third take and so on. Kathleen notes the best takes or "keepers" as she goes.

It may actually require 80 takes to get from start to finish in a single song.

Session notes

To avoid confusion, you should number all the takes consecutively. Do not start over with a new "take one" when you begin recording a new song. This way, it is always clear what piece of music a take number refers to.

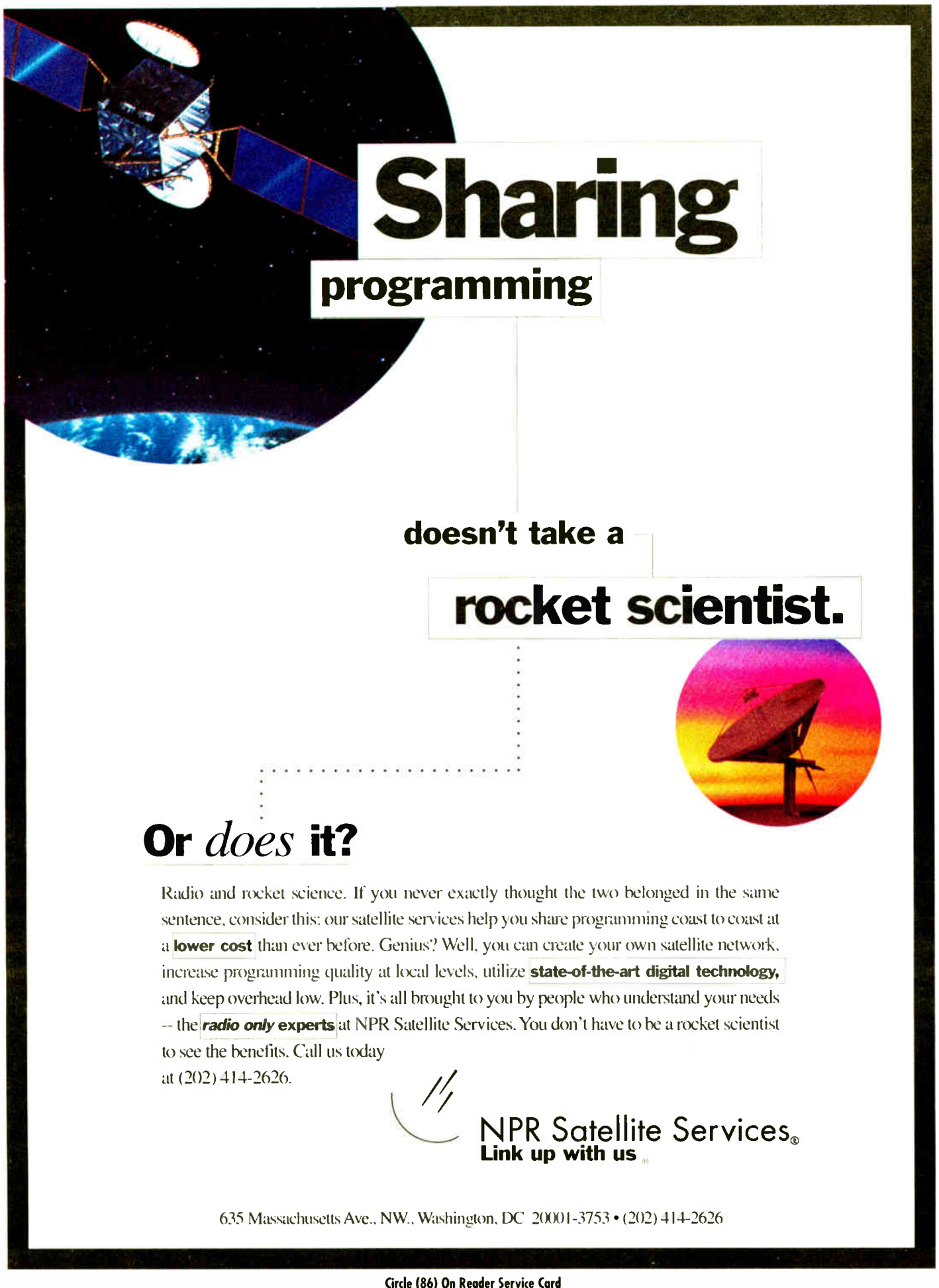
Suppose you are recording a concert. Before the audience arrives, ask the pianist to play the loudest passage so you can set your levels and mic distance.

What if there is no sound check? It is possible to approximate the correct level by setting the meters to read -12 dB on the opening applause.

By following all these tips, you should get a realistic, exciting recording of a grand piano for broadcast or CD pressing. Good luck.

□□□

Bruce Bartlett is a microphone engineer and technical writer, and the author of "Practical Recording Techniques" published by Howard Sams. Jenny Bartlett is a technical writer. Bruce can be reached at 219-294-8388.



Circle (86) On Reader Service Card

Learning the Hard Way

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He has earned it. Bob had built stations from scratch, helped an associate get one going in New Jersey, and there are photos in his office of him at WVOS(AM), Liberty, N.Y., clowning with a couple of Borscht Belt comics ... only some guys named Jerry Lewis and Red Buttons!

As I drove off for the last time, I thought about my big break and it made me a little sad for talent now on the way up. The small stations where careers normally begin are hiring "housekeepers" instead of potential talent looking for a break.

Mere bodies to drop local elements in wherever the syndication clock says to. Nameless nobodies emptying trash barrels and loading hard drives. How can talent be cultivated when the job only consists of loading pancake breakfast PSAs?

Ironically, the high-caliber network talent now beamed to these small stations are from the generation of mistake-makers and risk-takers given the rare opportunity to build a repertoire on similar local and regional outlets. Who will take their place when it is time for the next wave? The satellite revolution better have more than a five-year plan in place if there is to be much of a talent pool to pick from.

Souvenirs

My scrapbook contains my first paycheck stub from WSGO ($16 and change, after taxes) and a page from a 1980 program log I once filled out. The card Bob tacked to my door has remained in my wallet since he hired me. From my weekender days to my editorial position at **RW**, it has proven its worth as a good luck charm.

Funny, I decided if I had not found a job in six months, I would have gone back to my old job at a music store in New York City, selling saxophone reeds and viola mutes. If not for Bob Gessner, I would be listening to the radio to this day, wondering what could have been. Of such things are memories made.

Thanks for the break, Bob. Thanks for everything.

World Radio History

New Mic Passes Test

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less than that of the C414.

The C414 develops its bass farther down than the M 900. They have more in common in their high-frequency responses than with the U87. The M 900 is slightly more "peaky" and the C414 extends out slightly farther.

At a distance of eight inches, the high-frequency bump of the M 900 gives a heavy-pitch delivery an edge.

The M 900 has less proximity effect than the C414. At distances of 12 inches or more, the reduction in low-frequency response thinned out the mic's sound. This made the mic sound slightly "canny."

Sound from the sides

Perhaps the most distinguishing feature of the M 900, apart from its appearance, is its off-axis high-frequency response. In fact, one of the design goals was to attain an extremely uniform polar pattern.

The M 900 achieves this better than most mics I have heard. A lot of cardioid-patterned mics appear to be more directional because of their inadequate off-axis high frequency response.

Compared with both the U87 and C414 in cardioid pattern, the M 900 "hears" an amazing amount of high frequencies even at 90 degrees off-axis. If performers wandering off mic a bit have caused you problems, the M 900 may be a solution.

Given its wide-angle acceptance of high frequencies, I would like to try a pair of M 900s as drum overheads. Of course, this same feature would likely make them less successful in applications where you were trying to keep extraneous, nearby high frequencies out of the mix.

The most curious result of the tests was the difference in sound depending on which mic preamp was used. Both the in-board and lunchbox version of the A.P.I. mic preamps made the M 900 sound rough and edgy. There was no such edge when using the Amek/Neve 9098 and Mackie 1604 preamps.

The M 900 is about as sensitive to popping as a C414. Because of its unusual open-back design, a slip-on foam-sleeve pop filter has been designed. I tested the prototype and found that it greatly reduces the popping without changing the sound of the mic much.

Studio time

I spent an afternoon at 1137 Recording in Baltimore working with the M 900 and the Amek/Neve 9098.

Not surprisingly, the combination sounded as good on vocals as it had at Flite Three. Next, we set up for instrument recording. Our source was a Fender Strat guitar through a 130 W Music Man tube amplifier head to a Crate closed-back cabinet with four 12-inch Celestion 30 W speakers.

In the studio, the speaker cabinet sounded like nothing special. Just your typical cranky guitar/amp sound.

The M 900 sounded nice, but a bit too thin until we got it to within four inches of the cabinet and centered on one of the speakers.

Bingo! Platinum ribbons of sonic beauty. The hair stands up on my arm every time I tell this part of the story. For comparison we plugged in a Rode NT2 mic, which sounded edgy and harsh. We quickly went back to the M 900.

To be sure, the M 900 is not linear. It was adding warmth (and a lot of other things) to the sound of the bare cabinet, which by itself did not sound anywhere near as good in free air to the human ear. The M 900 provided a sense of "connectedness" to the sound of the guitar.

Maybe the increased warmth was filling in or masking holes in the guitar rig's frequency response. It is possible that a closely-positioned M 900 would not fare as well in a different situation. This is especially true where too much bottom would get in the way.

For both looks and sound, the M 900 definitely makes the grade as a mic that deserves serious consideration for addition to your mic locker.

□□□

After plodding around AES, NAB and other large conventions, Ty Ford thinks the organizers of such shows should consider handing out pedometers and establishing them as walk-a-thons.

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World Radio History

Digital Audio Production Software

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mixed to a mastering machine.

I can almost hear you say, "If that is how Fast Eddie works, I pass!"

Hold on. This is only an analogy and no analogy is perfect. Fast Eddie is much simpler than the old way, and in some respects is faster and easier than a multitrack.

Here is how it works. First, record each element of your production. The Record mode is accessed through the File menu and will ask for a file name when selected. The input level is displayed on a bar graph. Levels can be adjusted at the source or via the soundcard software. When the level is correct and the source material ready, select Record and you are rolling.

When done, select Stop and close the file. That is all there is to it. Fast Eddie records sound files in the .WAV format.

Fixing mistakes

If recording a 60-second promo with music bed, announcer and sound effects, you would record each individually and save them in separate files. Unlike analog production, you do not need to worry about mistakes.

If a line gets flubbed, just go back and continue. Likewise, the music bed can be started early or can end late. All of these problems can be quickly fixed later.

Once all elements are recorded, it is time to mix the final product.

The main window is subdivided into two parts. The bottom half is a read-only window. This is where you open files you intend to work on. The top half is a Modify window where you create the new file that will become the final product.

First, open your music bed in the bottom window. By clicking the right mouse button you can play the file and see if any changes need to be made.

Assume the music started early and ended late. Locate where you want the music to begin, place the cursor at that point and click on the Select option. Now move the cursor until it encompasses the portion of the music bed you want to use.

To be sure your selection is correct, place the cursor anywhere within the highlighted portion and click the right mouse button. Only the highlighted portion will play. When satisfied, select the Copy and Paste editing functions. The edited music bed now appears in the modify window.

Open the announcer file next. This file will now occupy the bottom read-only window.

Let us suppose this track has a coughing fit in the middle of the recording. Select and delete the offending portion. If you find you botched the edit, hit Undo and the file is restored to its original form. Then just re-edit it.

Fast Eddie keeps a history of the last 10 edits. You can access these through the Display menu and easily redo any changes you have made. The edit history will tell you what tool was used, where in time you used it, and if you chose to undo it later.

When the voice track is ready, you want to paste it over the music. First, check for length. Both windows have a time line running along their bottom portion.

Assume the voice track runs 40 seconds. Play the music bed in the top window until you locate the point where you want to insert the voice track. For our purposes, say the spot is 10 seconds in.

Place the cursor there, then access the Marker menu to position a lettered marker at that spot. Move the cursor another 40 seconds into the bed and place a second marker at the 50 second point. The portion between these two markers will be the place where you will paste the voice file. But not yet.

You will probably want to duck the music level to accommodate the voice. To fade across three seconds, cursor over to the seven-second spot (three seconds before your first marker) and choose Select. Drag the cursor to the 53-second point in the music. This 46-second area will now be highlighted.

From the Tool menu, pick Fade. Enter 0 dB as the Start and End amplitudes. Set the amplitude for your two marker points to -12 dB. Click OK and Fast Eddie performs a three-second fade at the seven-second mark, keeps the music 12 dB softer for 40 seconds, and then fades back up over a three-second interval.

Now to combine the two sound files. Activate the bottom window containing the voice track and select the entire file. Select Copy, and cursor over to the first marker in the music file in the top window.

Mix it up

From the Tool menu, select Mix. This opens a window to allow level adjustment of the destination file (the music bed) and the Clipboard (the voice track).

Because the music bed already has a fade, click OK to leave both sound files at their current levels. The voice will be pasted over the music bed at the area where the volume has already been ducked.

Play the entire file to be sure everything is satisfactory. If you want to fade out the music bed at the end, place the cursor where you want the fade to begin. Click on Select, hit the End key to highlight the entire music file, pick Fade from the Tool menu, and select Fade Out. Fast Eddie does the rest.

To add sound effects, follow the same procedures. All that remains is to verify that the promo is exactly what you wanted and save it.

Adding to Fast Eddie's versatility, I even use it to cut out pops and clicks other software programs miss when I clean up and transfer phonograph records.

Blink of an eye

One program I use takes more than two minutes to cut out a click in a 15-minute sound file. Fast Eddie does it in the blink of an eye. If I have 50 clicks to remove in a 15-minute sound file, Fast Eddie removes them in less than one minute, compared to nearly two hours for the other software. That is a real time saver.

Fast Eddie also includes a Gearshift tool to vary the speed of a sound file or just a portion of one. This is useful for trimming a spot that runs long. When applied to a sound file, the Gearshift screen tells you the length of the original file and what its new length will be with the chosen setting.

There are four clipboards in Fast Eddie for easy access to sound files you have modified but do not want to save. There is also a tool that allows you to cross-fade between two sound files. You can also adjust the volume of a sound file and even reverse it if desired.

Fast Eddie has a couple of other interesting features as well. One is a Sound Catalog that lets you list a series of sound effects on a screen and select any particular one by clicking on it. Morning shows that use sound effects will appreciate this. The program is separate from the main Fast Eddie program, even though the individual effects are created and saved in the main program.

Fast Eddie also has a Playlist editor that allows stringing together a series of sound files. It permits you to select an order of sound files and the time frame in which they play in relation to each other.

With sufficient disk space, this feature can combine music, spots and weather, creating an hour-long radio program.

Drawbacks

Fast Eddie's weakness is its spartan tools. Equalization is limited to high and low shelving. To the company's credit, the shelf can either cut or boost. Even some high-priced software is limited to cut only.

The record menu is equally sparse. You have a choice of Record, Stop and Save only. To redo a portion of a file, you must start anew or create a second file beginning at the glitch and perform Cut and Paste procedures.

It would be nice if Fast Eddie included graphic and parametric EQ, a compressor/expander and reverb. But these would only drive the cost up while slowing the processing time down.

If you want a full-featured digital audio program and are willing to pay the price, there are plenty of good ones out there. But for no-frills software that is extremely fast, easy to learn and gets your feet wet without giving your bank account a bath, Fast Eddie is definitely worth a try.

Digital Audio Labs is at 14505 21st Avenue North, Suite 202, Plymouth, MN., 55447.

□□□

Read Burgan is a freelance writer and former public radio station manager. He can be reached via e-mail at AH746@detroit.freenet.org or by phone at 906-296-0652.

Product Capsule: Fast Eddie

Thumbs Up
- ✓ easy cut/paste operation
- ✓ very inexpensive
- ✓ boost/cut EQ
- ✓ sound catalog and playlist

Thumbs Down
- ✓ does not emulate multitrack
- ✓ no DSP effects

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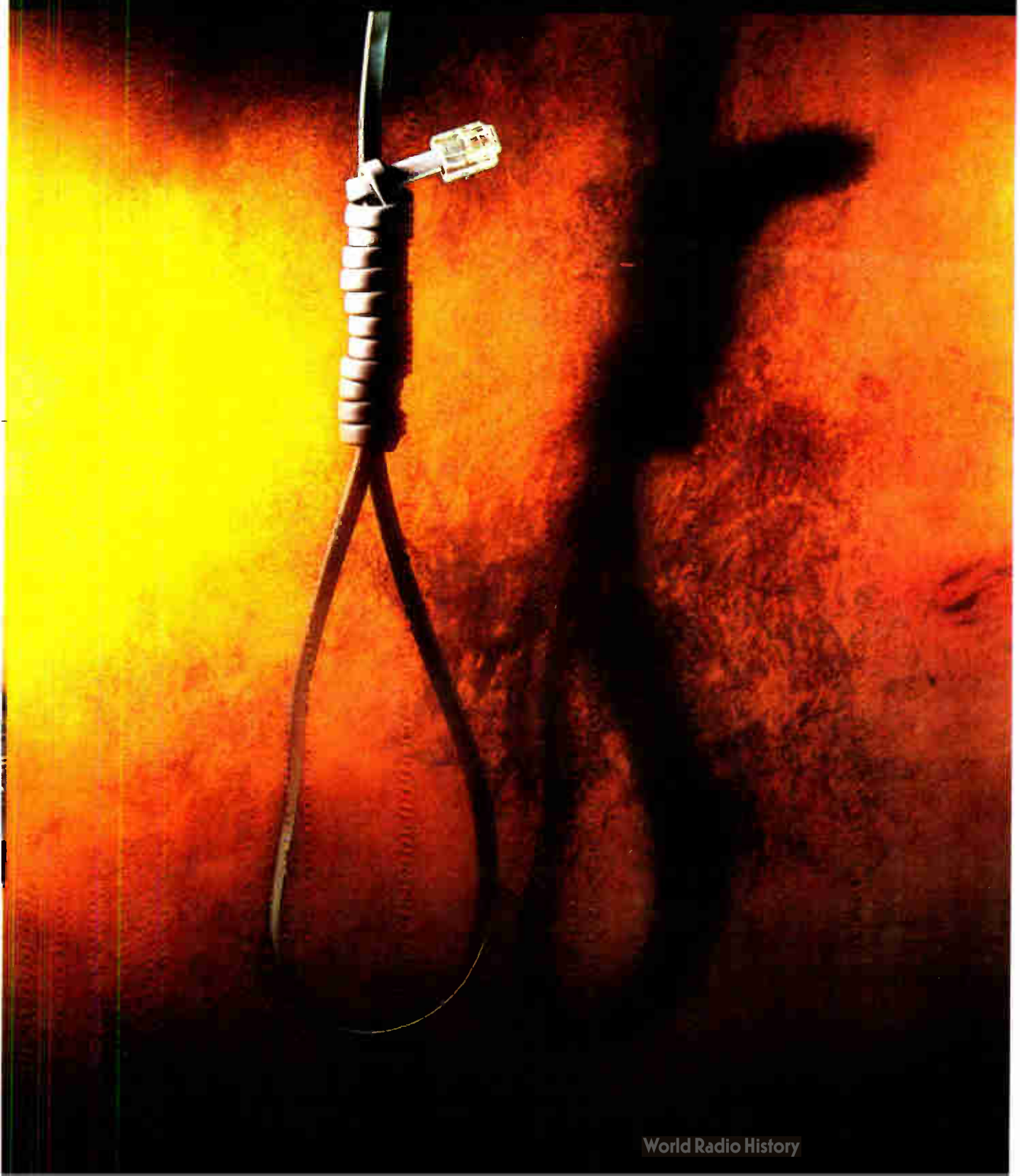

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National Public Radio Goes Totally Digital

by Alan R. Peterson

WASHINGTON The headquarters of National Public Radio (NPR) is about to enter the digital age.

The NPR complex on Massachusetts Avenue entered into an agreement with Sonic Solutions to equip the facility with a digital radio workgroup system.

Under this agreement, Sonic Solutions is providing NPR with the first full-resolution audio system where every piece of audio in the facility will reside on a hard disk and can be manipulated in a fully distributed, fully networked system.

Editing of program elements and production of long-form programming will be done entirely in the digital domain.

Miles of tape

Walk into the spacious new multistory NPR building at 635 Massachusetts Ave. If they let you past the security desk, you will be in for a surprise: dozens of tape recorders running everywhere.

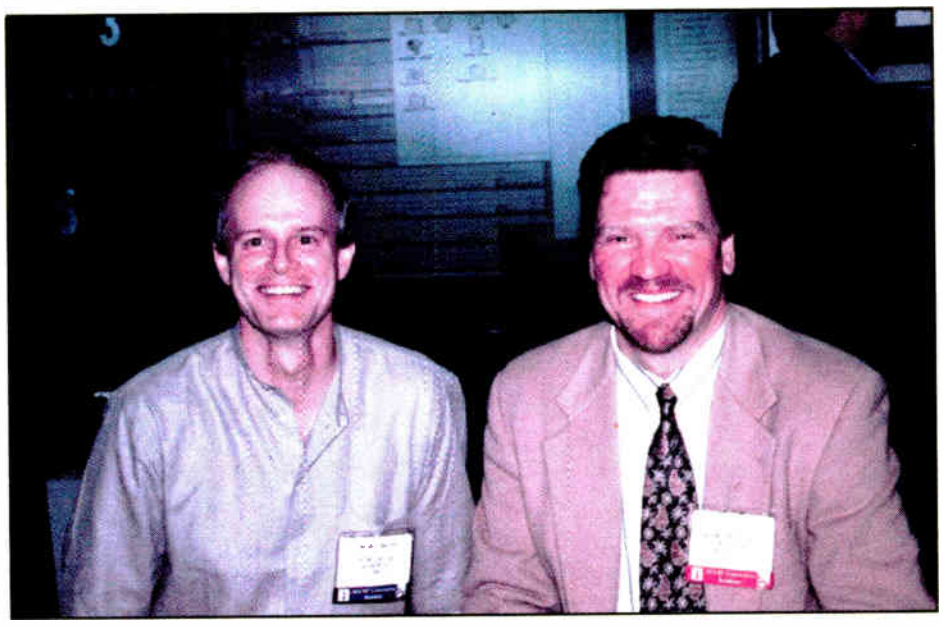
Analog Scullys, MCIs and Otaris in nonstop motion, capturing and editing the bits and pieces of sound that form the essence of NPR's "Morning Edition," "All Things Considered" and "Performance Today."

NPR decided to stay with analog following the move from the former location on M Street. However, this does not mean the realities of digital have been ignored.

The fact is, NPR has been working digitally for some time now. Studio 4A, the big multitrack performance studio, records to a 24-track Sony digital reel machine. On the fourth floor, NPR has been using Sonic systems for long-form program production and the NoNOISE system to clean up program material. This digital quality is evident.

Even analog productions at NPR have outstanding audio quality; a testament to the ears of the producers and the skills of the engineering staff maintaining the recorders.

It almost seems incongruous that a facility as advanced in audio purity, programming diversity and satellite uplink technology would still be recording and producing on quarter-inch analog tape. That is all about to change.



NPR's Tom McCarthy (left) and Kirk Paulsen of Sonic Solutions

together material from many different sources or reels.

The NPR system will also include a broadcast playback server which handles the on-air execution of audio. Sonic has provided a way to incorporate a time-of-day and event-driven interface to play out audio streams. Directors and engineers in the on-air studio can monitor and control the sequencing of programming with exact timing.

Presently, the playback of programming occupying more than one reel must be critically timed to fit within the network window. If one tape machine should slow down or begin to drag, the overall timing of the show is thrown off.

Under digital control, program timing and sequencing is assured.

An added benefit: With an audio network in place, the process of taking the elevator from floor to floor with a stack of tapes is eliminated.

The transition from tape to digital in a facility the size of NPR will take some time. The floor plan includes several editing stations, music and performance studios, a roundtable talk studio and a number of smaller playback and editing suites.

The first installations are underway and completion of the project is projected to be mid-1996.

NPR's Studio 2A and Sonic Solutions

New methods

One of the many roles of the Sonic system at NPR will be to capture incoming feeds and make them instantly available to news editors. This will eliminate the time lag in recording the original source to analog tape, running multiple copies (with an inherent loss of quality) and physically splicing

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[1]FCC Declaratory Ruling, 4 December 1989 and Modulation Measurement Public Notice, 31 January 1991.

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World Radio History

Amateur Radio Fellowship Thrives

by Al Parker

HICKSVILLE, N.Y. Attending the recent AES show in New York allowed me to see tantalizing tape decks, scintillating software and magical mixing boards. I also got to mix it up with hoards of hams.

A casual survey revealed that men and women in the music and pro-audio industries share more than mics and meters with their broadcast kin. A number of folks in these fields have more than a passing interest in amateur radio.

It should not come as a shock that these industries boast large numbers of hams. Some on-air and behind-the-scenes professionals were first addicted to sound and RF as ham radio operators.

The desire to go beyond the limitations of puny soundwaves and convert them to the exalted frequencies that send them far away at the speed of light is common to all who work or play behind the microphone.

Taking the plunge

Our casual survey also revealed a sizeable group consisting of those who always wanted to be hams but somehow never got around to it. The reasons ranged from garden-variety inertia to fear of the technical and/or code requirements.

For most, the Morse code is the biggest obstacle. I know it was for me; I hated learning the code. But today I would fight tooth-and-nail to preserve that element of the process.

Code is the internship, the hazing, the buzzcut, the right-of-passage that demonstrates the prospective Ham's level of commitment. In a sense, the "code ordeal" is the glue that binds the community together.

The code requirement for voice operation on the HF bands keeps many of the nihilists out. Most ne'er-do-wells bent on making mischief find code to be too much work.

Frankly, the code is largely responsible for ham radio's "mystique." Some folks prefer it to voice communication, which I will never understand.

For those who simply cannot endure code, the FCC and American Radio Relay League (ARRL) have some very attractive options.

A Technician Class license can be obtained by passing a relatively simple test with no code requirement. As an added convenience, these tests are administered locally by amateur radio clubs.

Tech and Novice licenses are useful first steps, providing entry to the world of VHF/UHF, FM and digital modes. Rigs that fit into a shirt pocket can reach across counties and even states thanks to a network of repeaters.

Even on these elementary levels the magic of amateur radio becomes apparent. The spirit of generosity and community service is evident even in the limited universe of entry level licensees. You can experience unselfish sharing of technical information, traffic reports and emergency communications, and best of all, plain old "rag-chewing" with an ever-expanding universe of new friends.

Greater rewards

Additional tests to step up technical and code requirements allow you to painlessly upgrade. Higher license classes bring additional operating privileges in more frequency ranges. This all leads to the coveted General Class license and the world of High Frequency.

HF is defined as the world between 1.8 and 30 MHz. With this license in hand and a 100 W rig, the world is your oyster!

The incentive licensing concept spoon-feeds new hams. This is one of the few areas in life where minimal work input reaps great reward output; like a slot machine that pays out more than you put in.

Your local Radio Shack and the ARRL (225 Main St., Newington, Conn., 06111-1494) offer packages and code practice tapes to walk you through the process.

Part of the fun of ham radio is that very little is preplanned or scheduled. This may be the reason broadcasters find operating their ham stations so cathartic.

"Calling CQ" is like casting a line into the water. Some days there are few nibbles, other days there is a feeding frenzy. For those who prefer a bit of structure to their listening, Ham Radio offers a plethora of regularly-scheduled "nets."

continued on page 57 ▶

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Inside the Microcontroller

▶ continued from page 21

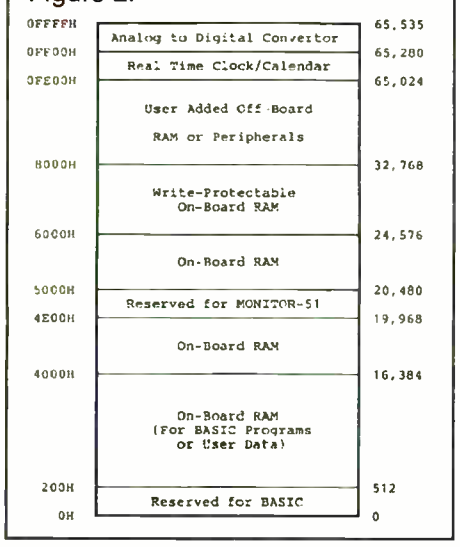
strings. The nearly 16K size of this block is more than enough memory for most BASIC applications. However, the amount of memory allocated to BASIC can easily be increased or decreased.

This can be accomplished either from within BASIC, or as a configuration byte read by BASIC during reset. Many BASIC applications will require much less than 16K of RAM. The user may then allocate large amounts of memory for external data storage or for assembly language applications.

The 16,384 to 19,967 block (4000H-4DFFH) contains a number of specific addresses referenced by BASIC, as well as mirrored vectors for all of the CPU's interrupts.

If the user wants to service the CPU's interrupts external to BASIC, vector addresses which transfer control to the appropriate assembly language routines must be located in the 16,384 to 19,967 block. Other than the first 75, the rest of this block can be used in any way suitable to the specific application (including program or data storage).

Figure 2.



The region 19,968 to 20,479 (4E00H-4FFFH) is the MONITOR-51 data area block, which has a function similar to the BASIC Data Area. MONITOR-51 uses this block to store system parameters such as Break Point information. However, this block is located in an area addressed as both program and data memory, which allows the CPU to execute assembly language instructions out of it. This is a necessary requirement in order for MONITOR-51 to be able to access the directly addressable internal memory space of the CPU.

If the user implements a write-protect configuration that disables write accesses to this block, the MONITOR-51 program will not function properly.

The 20,480 to 24,575 (5000H-5FFFH) block of memory is not specifically allocated to any resource and there are no restrictions on how it may be used.

The block of memory marked as 24,576 to 32,767 (6000H-7FFFH) is the write-protectable area where BASIC stores programs when the Save command is entered. Also, during reset and initialization BASIC reads the user configuration stored in the first few memory locations in this block.

The space 32,768 to 65,023 (8000H-0FDFFH) is available for user-added external memory, I/O devices or other peripherals. The bus expansion connector of the Micro-440e allows the user to add up to an additional 32K of memory which can be addressed from locations 32,768 (8000H) to 65,023 (0FDFFH).

The 256-byte page of memory allocated from 65,024 to 65,279 (0FE00H-0FEFFH) is where the on-board RTC is addressed. All addresses between 65,024 (0FE00H) and 65,279 (0FEFFH) access the RTC.

The 256-byte page of memory marked from 65,280 to 65,535 (0FF00H-0FFFFH) is where the on-board A/D is addressed.

The first 16K of the Micro-440e's EPROM contains both a BASIC interpreter and a debug monitor. This gives the user the option of programming in either BASIC or 8051 Assembly language.

When power is first applied to the Micro-440e, the internal BASIC interpreter program is executed, which allows the user to program in the BASIC environment.

The Mon command in BASIC transfers control directly to the debug monitor, allowing the user to program in Assembly language. While in the MONITOR-51 environment, Go (Go To Zero) invokes a software reset that transfers control back to the BASIC interpreter.

If the user will be programming exclusively in assembly language, a BASIC reset option can be invoked which transfers control directly to the MONITOR-51 on reset.

In summary, the BASIC includes a full-featured floating-point BASIC interpreter with a control-oriented instruction set featuring 120 commands, statements and expression operators. File management commands Save, Kill, Xfer and Dir exist for manipulating BASIC programs in write-protectable RAM.

A pulse-width modulation (PWM) command can be used as a signal generator to produce sound or musical notes. Idle and Sleep commands take advantage of the CPU's reduced power modes.

The Basic also contains the MONITOR-51 software, which is a resident debugger for Assembly language programs.

One software option is MonScope-51, a symbolic debugger utility that contains virtually all of the functions of MONITOR-51 as well as many added capabilities. Another is the A51 Macro Assembler, which is a full-featured cross-assembler for all members of the MCS-51 family.

□□□

Jim Somich is a radio broadcast engineering consultant and president of MicroCon Systems Ltd., a manufacturer of broadcast equipment. He can be reached at 216-546-0967.

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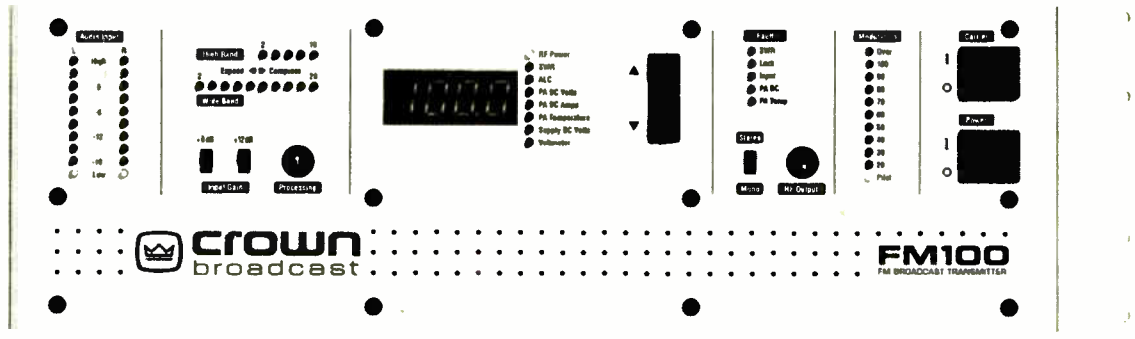

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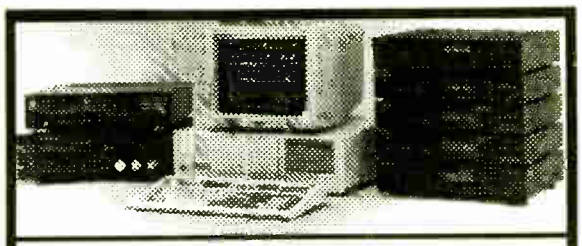

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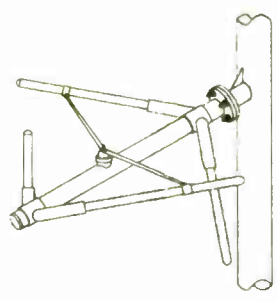

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READER SERVICE NO. 72

World Radio History

USER REPORT

Radio Systems Delivers at WCSX(FM)

by Bob Deitsch
Director of Engineering
Greater Media Radio

DETROIT A funny thing happened on the way to the use of mass digital storage in major market radio: manufacturers were not designing systems that the top markets wanted to buy. Reliability, cost of redundancy and ease of use have been the major impediments. I am happy to say that this is no longer the case.

The Radio Systems DDS has been in use at one of our Detroit facilities, WCSX(FM), for two months. I can report to you that it is an excellent solution. Why is the DDS unique? It combines the advance of mass digital storage with the hardware functionality of conventional cart machines and does not require any ability by on-air talent to use a mouse, a cursor or a touch-screen. A D.J., news person or communicaster is comfortable using the DDS within a minute of its implementation.

The face of a unit looks much like a standard cart machine. A cut is selected by pushing its number sequentially on the marked keys and hitting the enter button. All commercials, sound effects and promos are recorded in the system.

Information about the selection is immediately visible on the high-resolution (as good as VGA), backlit LCD screen. This includes cut number, name, cues, kill dates, time remaining and time elapsed.

The operator can push the control buttons at the bottom or use remote control from the board. Note that the actual audio intro and/or outro of the selected cut can be easily auditioned with the marked buttons.

At WCSX, we have placed four DDS cart machines in the main air studio, a single unit in the news area and a CRT terminal in each of the two production facilities. The DDS in news has a keyboard attached and is capable of record/play operation.

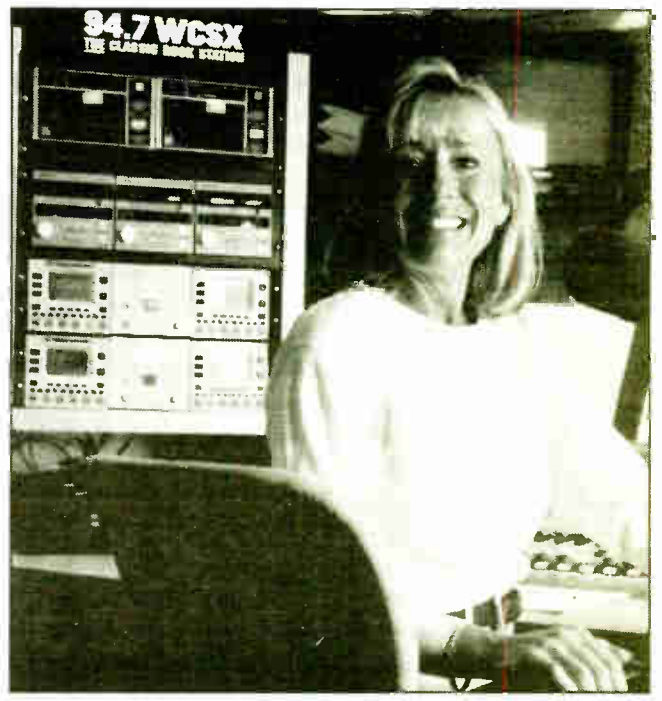
Redundancy option

In production areas, CRTs are used for inputting data and audio. We have decided to keep our audio inputs to the system analog and have chosen the redundancy of two servers, each of which mirrors the audio input to either commercial and thus the revenue stream is protected.

Audio is not carried on the network; only data and control information. Each DDS cartridge machine is connected through a serial port. In our case, the ports are about 100 feet removed from the servers.

Fully multitasking

CRTs and keyboards are connected with Sybex extenders. The UNIX-style operating system is Intel, standard PC-based and designed from the get-go to be fully multitasking. There are absolutely no perceivable system response delays. Mirroring occurs in the background within seconds. A sound slate can be used for instant access to any stored cut in groups of well over 100. These can plug into any DDS cart head.



WCSX midday personality, Karen Savelly, is happy to have DDS in her studio.

During the first two months of constant on-air use, not one air unit has been missed. We intend to add two additional servers for use on WRIF(FM) shortly. Any spots that run on both stations will only need to be produced once. We can even automatically run separate tags on the two stations without double recording of the body of the commercial. This will increase our production efficiency to a level that will pay for the system before it is fully depreciated. We also intend to use our traffic system to program spot breaks, allowing talent more time to attend to other matters.

The staff at Radio Systems has been available to us and cooperates to an extent not often found in today's impersonal sales environment. Suggestions for software modifications have been welcomed and implemented where warranted. I could not be more pleased.

□□□

For more information from Radio Systems, contact Dan Braverman in New Jersey at 609-467-8000; or circle ***Reader Service 65.***

USER REPORT

Broadcast Electronics Vaults into Heftel

by Doug Holland
Director of Engineering
Heftel Broadcasting Corp.

LOS ANGELES Back in the late 1980s I was looking for a cost-effective way to eliminate cartridge tape and cart machines in our facilities. The primary reason for this was that when I arrived at the facility, almost every cart machine in the place needed new heads, pinch rollers, etc. The cart inventory was a nightmare and it all sounded pretty poor. I wanted to eliminate cart noise and phase errors caused by tape misalignment and get rid of the tape inventory. It was time to enter the digital age.

I did some vendor research and discovered that there were very few companies who actually built their own cards for a digital record playback system. Instead, companies used vendor boards that were adapted, rather than designed for the purpose. The vendor approach is subject to many flaws. I wanted a system to grow with, not just go with ... until the companies changed their minds on what they wanted to do. One company that did build its own cards was Broadcast Electronics.

About five years ago I installed my first Broadcast Electronics AudioVault. The results, while not perfect, showed others and me the value of the product BE was offering. Now BE offers the AV-100 and there is no question the proper decision of designing and building a product specific for the task was made years ago.

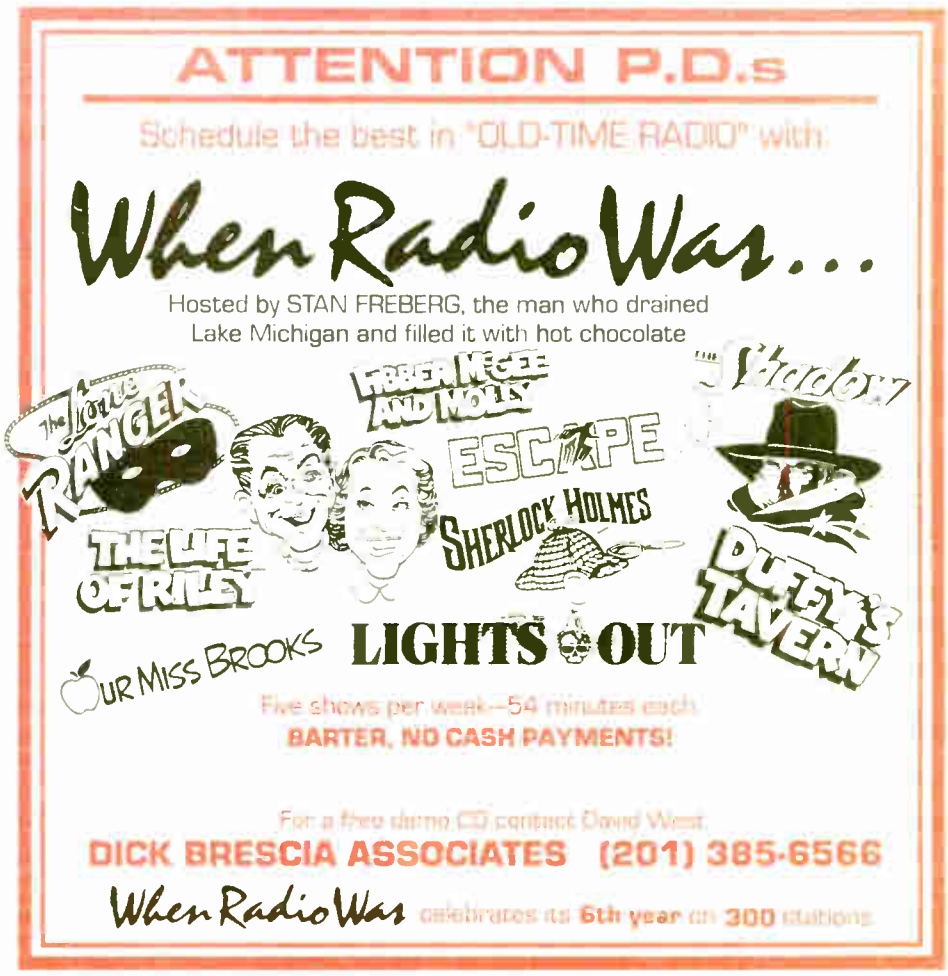
The early days of AudioVault consisted of a mainframe (manufactured by others) and a user interface provided by BE. The system had a maximum of four ports and used a RS-422 interface for data. It was very limited in what it could do, but certainly served its intended purpose well.

Instantly impressed

BE introduced the current version of AudioVault AV-100 about three years ago. I was one of the lucky people who managed to get my hands on one of these cards and install it in my PC. I was instantly impressed with the features and how easy it was to install. The card came right up.

The software had many new features; the most dramatic being cut-by-cut selectable digital compression. This allows the user to save disk storage space while at the same time offering different compression ratios for various kinds of program material.

continued on page 55 ▶



Circle (41) On Reader Service Card

World Radio History

USER REPORT

WAAF(FM) Rocks with VoxPro from Harris

by Eric Fitch
Chief Engineer
WAAF(FM)/WWTM(AM)

BOSTON WAAF(FM) recently acquired an Audion Labs VoxPro Digital Recorder from Harris Allied for recording and editing phone calls in the air studio. Based on a Power Macintosh 6100/60 platform, the VoxPro features a custom control surface that allows the DJs to record phone calls on a hard disk and edit them electronically.

The VoxPro has replaced the MCI JH-110 reel-to-reel recorder that has been the workhorse machine used to record calls for years. Currently, we are in the process of replacing our analog recorders with digital-based audio systems.

The end result is a perfect edit every time, done 10 times faster.

The VoxPro has allowed the jocks to spend more time working on the creative aspect of their shows rather than the mechanics of editing calls. Gone is using a grease pencil, razor blade and the roll of splicing tape (that inevitably falls behind the tape machine). The end result is a perfect edit every time, done 10 times faster with a marked improvement in audio quality.

A word processor for sound is the best way to describe almost any digital workstation. The VoxPro makes editing digital audio very easy. The primary reason I chose the VoxPro over competitive systems is the optional control surface that is offered.

Sledgehammer-like force

The VoxPro has the often-used commands on a compact (13 inches wide by eight inches deep by one inch high), well-designed dedicated panel. The buttons are very sturdy and able to withstand the sledgehammer-like force typically used by our jocks. The buttons are better than the modified QWERTY keyboard featured on other editors.

Also, the dedicated control surface that allows access to all of the functions needed to record and edit a call is much better in a fast-paced air studio. There are some advanced features that do require the supplied mouse and keyboard to access, but they are seldom used. I would recommend storing the keyboard and mouse in an accessible keyboard drawer.

The staff was able to learn how to operate the system in the first five minutes of their shifts. They all love it. They are able to stack up calls using the 10 assignable cart play buttons so they can have instant access to any cut without having to fast forward or rewind. Cuts are started from the beginning using the Play Beginning button no matter where you are in the edit. The staff can record and edit on the fly — just hit the Insert Record button and a quick one-liner can be added to a dull conversation.

The Copy, Cut, Paste and Undo buttons work just like they would on a word processor, allowing you to repeat the same phrase over and over and over and over and over. The Zoom In button pops up an expanded wave table that allows you to find the exact edit point using the mouse.

The time slide edit allows you to spread the two audio channels apart so you can edit one channel at a time. This is great if you need to keep the caller from stepping on your jock's lines.

Our afternoon personalities, Opie and Anthony, have a character they call "Curse Man." Curse Man is a fellow who calls in and sprinkles his comments on the day's events with colorful language that must be "bleeped" to prevent an inappropriate word from being aired. The Bleep function allows a 20- to 30-minute edit job to be done in a matter of a few minutes.

The VoxPro has allowed WAAF jocks more time to work on the creative aspect of their shows.

The frequency response is rated at ±0.5 dB, 20 Hz to 20 kHz and the signal-to-noise ratio is 86 dB ("A" weighted). THD plus noise is .01 percent at one kHz using a 44.1 kHz sample rate and 16 bit 64 times oversampling. It requires 10.6MB/minute for stereo record.

Increase recording time

The standard configuration of VoxPro is supplied with about 33 minutes of stereo recording time. With 11 jocks on our staff, that allows only three minutes of recording time per person. Currently, the jocks have to empty their password-protected folders daily to allow enough space for everyone. Therefore, we will be adding another hard drive in the near future to increase the available record time. A 1GB SCSI hard drive will provide another one and one-half hours of stereo record time.

The neat thing about computers is that you do not have to buy a whole new box just to add a new bell or whistle to a product. Some of the digit-head features on the VoxPro that I like are the built-in dual mono AGC, the start-on-sound option and the built-in oscillator.

One of the new features in the VoxPro version 1.6 is an audio processor that helps keep caller levels consistent. It has two discrete mono/strappable compressor limiters that can be set up independently for each channel.

Our phone system is configured with the caller audio feeding the left channel and the jock's mics submixed to feed the right channel. That way the jock can talk to the caller in full duplex mode using the studio microphones and listen to the caller via the cue speaker. Start on Sound waits until the audio reaches a user-defined threshold before recording begins, keeping the start of the cuts tight.

Lost in Space

There is a handy oscillator that has variable frequency and level if you need a quick 1 kHz tone to check console I/O levels. The oscillator also makes cool 1960s "Lost in Space" -type sounds as you glide the mouse back and forth quickly on the frequency adjust menu.

This is my first Mac. Having grown up with DOS and been dragged kicking and screaming into Windows, the Macintosh is amazingly simple — no messing around with sound cards, interrupts and other DOS quirks. The hardest part was plugging the keyboard, mouse and remote control console together using the supplied cables. The software is pre-installed, and when you turn on the computer the program starts automatically.

My first contact with customer support (and every one since) has been excellent. A friendly, knowledgeable and patient technical support engineer answers the phone in Beaver Creek, Ore. They are understanding of newbie Mac users' questions about the system.

My one complaint about the VoxPro is that the audio I/O is not balanced +4 dBm. It uses the Macintosh one-eighth inch stereo minijacks. I was a little disappointed when I opened the box to find a stereo RCA-to-minijack cord as the audio cable. The manual lists a consumer-to-professional matchbox as an optional accessory. I am of the opinion that if a manufacturer uses the term "Pro" in the name of the product, it should be supplied with balanced +4 dBm inputs and outputs.

I do realize that consumer equipment specs are equal to or greater than a lot of the professional equipment on the market, so I have no problem using the Mac sound card. However, professional equipment should hand off a signal that is at the same level and impedance as the rest of the equipment in a typical broadcast studio.

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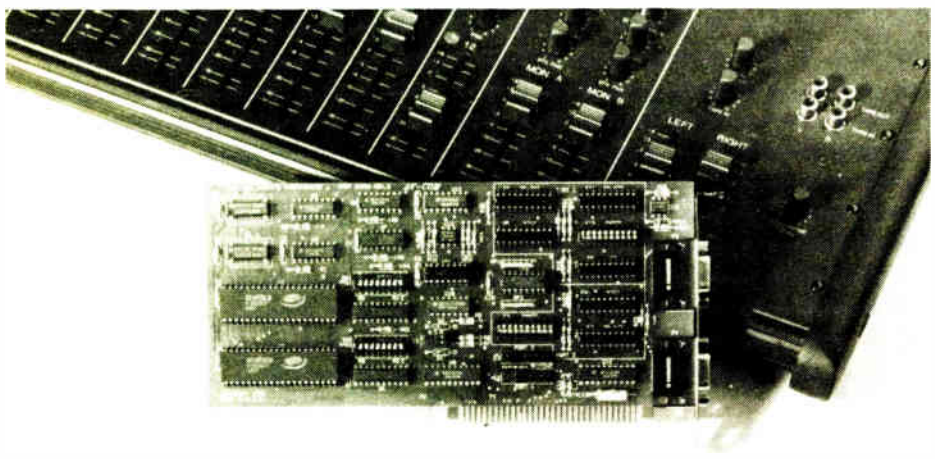
For more information from Harris Allied, contact the company in Indiana at 317-962-8596; or circle ***Reader Service 204.***



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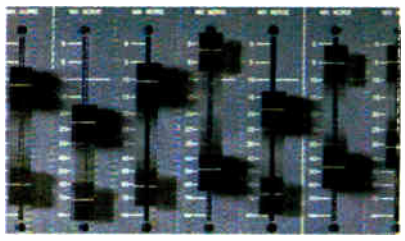

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Circle (120) On Reader Service Card

World Radio History

USER REPORT

MD Recorder by Denon Hits It Big

by Sean Caldwell
Creative Director
WPLY(FM)

PHILADELPHIA Two months ago I received two Denon MD Cart Recorders (DN-990R) and players (DN-980F). The easy-to-set-up, user-friendly units sound great. In less than 30 minutes we installed the two recorders in each of our production studios and the two playback units into the air studio.

Both units have balanced XLR connectors and standard power plugs. After hookup, we adjusted the input levels on the rear of the unit so average levels peaked around -12 dB. Connections are also available for digital inputs and outputs.

There is a strong resemblance between the Denon MD carts and the widely used Denon CD cart machine. The track selection and start/cue buttons are positioned identically and function the same way on both machines. DJs or board-ops who are comfortable with the operation of the CD cart machines will feel at home with the MiniDiscs.

From DAT to disc

We first used the machines for a feature on one of the top-rated Philadelphia morning shows: the "Best of Barsky." When our morning-show crew vacations, we play pre-recorded bits from previous shows. In the past we would dub them to reel, edit and then dub them to individual carts. Now with the MD Cart, we can copy them straight from our DAT archives to MiniDisc, digitally edit on the machine with 11 ms resolution accuracy and label the tracks.

Each disc can store up to 74 minutes of audio. During final broadcast, the user selects a track that is cued to the absolute start of audio and starts it from the board.

In the production studio, the Denon MD cart helped with a variety of tasks. When we produce promos and commercials, we frequently use pre-recorded drops from movie soundtracks or other production elements. The MiniDiscs proved superior for this type of work by providing immediate access to 255 cuts with the turn of a knob — no waiting for a DAT to cue up or to switch reels.

A portable unit in the field allows us to record interviews with bands or newsmakers. The talent can either edit on the MiniDisc unit in the field or later in the studio. It saves the time of dumping audio into a workstation, editing and then copying back. This setup also benefits news gatherers by allowing them to edit stories or sound bites in the field when time is critical. Some of the editing features include move, divide, combine and track-erase as well as the naming features.

Denon's DN-980F and DN-990R MD Cart Recorders and Players are user-friendly.

The units feature a preset menu enabled through the front panel buttons. You can select options such as eject-lock during recording or playback, normal speed or a two-percent bump, audio level to cue (-72 dB to -36 dB) and when to send an end-of-message signal. The units also have the ability to insert a cue signal anywhere on each track to activate an external event.

Easy to control

Windows-based software, an option to the Denon MD Cart, makes controlling, editing, and labeling tracks and discs easy. Connect the nine-pin RS232 on the back of the unit to the computer and you are ready. The computer control also makes copying MiniDiscs simple.

We have found the MiniDisc to be more economical compared to standard audio carts for certain projects. With the ability to store 74 minutes of digital audio and 255 indexes available, the MiniDisc is an indispensable tool for many projects.

There were some initial concerns over the bit-rate reduction employed with the MiniDisc format. We set up an a-b comparison between an original CD, a digital copy as well as copies run through multiple-generation transfers. After six generations, no apparent degradation occurred to the sound. Near 10 generations, a professional with a keen ear could notice a slight difference in the audio, but nothing apparent to the average listener. If there are any suggestions for improving the Denon units, they are minor.

I realize Denon tried to keep the front as uncluttered as possible; however, having the ability to adjust the input level on the front of the units would be nice. Also, I would like the ability to plug a standard AT-style keyboard into the back for easier labeling of tracks.

DJs feel right at home

I believe Denon has succeeded in producing a unit that can easily replace a cart machine from a quality as well as aesthetic standpoint. Their similarity of operation to the Denon CD machines makes DJs feel right at home. The units' sound quality is close to a CD recorder and you can record thousands of times on one disc. And just think, no more azimuth adjustments.

□□□

For more information from Denon, contact Mark Kaltman in New Jersey at 201-575-7810; or circle ***Reader Service 197.***

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RBDS is an exciting new technology that can increase your stations revenue today. The SC-100 lets you take advantage of all that RBDS has to offer. We have a comprehensive guide that explains all of the ways that RBDS can benefit your station now. Call, or fax us for a free copy today!

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Circle (162) On Reader Service Card

WUSR(FM) Upgrades with CD Players by Marantz

by Peter Sakowski
Chief Station Operator
with John Farrell
and John Kalafut
WUSR(FM)

SCRANTON, Pa. In conjunction with a move to new facilities, WUSR(FM) recently added two new compact disc players for on-air broadcast use. Broadcasting at 99.5 MHz, WUSR is a non-commercial radio station operated by the University of Scranton and serves more than 700 square miles of northeast Pennsylvania.

Our previous on-air CD player provided 10 years of good service but was beginning to show its age, primarily in terms of reliability. We have retained it for production purposes where occasional glitches do not matter in terms of degrading on-air efforts.

Early in the search for a new source CD player, the provision of balanced outputs was identified to be fundamentally important, supplying an added layer of RF immunity along with better signal-to-noise ratio. But somewhat surprisingly, we found the choices of balanced units to be quite limited, especially within a reasonable price range.

The Marantz PMD321 balanced CD player met these criteria. We purchased two units, both for on-air studio use, to gain extra levels of flexibility and back-up.

Marantz's PMD321 CD Player met WUSR's prerequisites.

Out of the box we found that it took a while to get used to the new PMD321s in terms of functionality, compared to the previous unit. However, the operation manual was well-written and easy to understand,

continued on page 53 ▶

World Radio History

"I can't believe Bob finally did it!"

Karen Savelly
Mid-Day Air Personality
WCSX Greater Media
Detroit, MI

Bob Deitsch, director of engineering at WCSX, has been in radio for 35 years and until he saw the DDS Digital Delivery System, he didn't believe anyone could come up with a digital alternative that answered the stations' needs.

Studio talent wanted the familiar, easy feel of a cart machine. Engineering needed ultra dependability and redundancy.

DDS by Radio Systems answers everyone's needs.

The cart machine emulator interface is a breeze to learn and use.

Jocks air spots while the dual CPUs record and store all of the commercials, jingles and liner audio.

DDS has been on the air at WCSX for over three months and not one spot unit has been missed!

For WCSX-FM, Bob placed four DDS cart machines in the main air studio, a single unit in the news area, and a CRT terminal in each of the two production facilities.

Contact Harris Allied to find out why DDS is making believers out of the radio industry's toughest customers.

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World Radio History

USER REPORT

Dynamax Is Dynamite for KOSI(FM)

by Rodger Tighe
Chief Engineer
KOSI(FM)/KEZW(AM)

DENVER The happiest day of my broadcast career occurred during the spring of 1992. It was the day I decided to throw away all of my cart machines. Like many radio stations, my facilities contained 20 or more NAB cart machines, all of different ages, makes and models; some mono and some stereo. The same went for the other NAB carts — you name it, we had it. It seems that I spent half of my time working on cart machine problems.

As my 1992 capital budget allowed for the replacement of all of the cart machines on the FM side, I had been asking around. On this particular day, I saw an ad in this publication for the Dynamax DCR1000 digital cart recorder.

A quick call to Fidelipac, the manufacturer in New Jersey, answered most of my questions. The DCR1000 digital cart machines were being introduced at the upcoming spring NAB show, the factory had completed its first production run, they were priced comparable to analog cart machines, a few units were in service and they could ship my order within 30 days.

The DCR1000 machines use the standard 2MB computer disk for the cart. Otherwise, the units look and feel just like what the DJs are used to. The length of time available on the carts (we still call them carts) is determined by the sampling rate selected and whether the recording will be in stereo or mono. Buttons on the front of the record amp toggle between stereo and mono and four sampling rates.

Better on-air sound

With stereo and 26 kHz sampling rate selected, we get 63 seconds of 12 kHz distortion-free stereo audio which sounds better on the air than the old NAB cart machines did on their best day (crosstalk, wow and flutter and phase error are all immeasurable). For our call-in request shows, mono and a 22 kHz sample provide nearly two and one half minutes of recording time. If longer times and/or higher-fidelity recordings are required, 13.3MB floppy disks are available. Now Fidelipac even offers a magneto-optical drive option capable of recording up to two hours of stereo or six hours of mono.

We mix and match modes and sampling rates and use whatever 2MB disk is on sale at the local office supply store. We buy unformatted disks as part of our quality control process. When the disks are placed into the drive, the DCR's built-in LCD reads: BLANK DISK - PRESS STOP + START TO FORMAT.

Next, the disk is checked with the machine's built-in diagnostics program. During this process, the Liquid Crystal Display (LCD) will show any errors. If error-free, the disk is recorded and again checked for errors before being sent into the on-air control rooms. If a disk does show an error, it is bulk-erased, reformatted and rechecked. Any disk that fails this test is discarded. We occasionally find disks straight out of the box that will not pass the test.

Nearly all of our commercials are broadcast without ever having been on tape.

Utility-type programs

Incidentally, the DCR1000 has two built-in utility-type programs. The diagnostic test (CTRL E on the keyboard) locates disk errors and the media test (ALT T) examines the entire disk surface.

We use the DCRs for our most important audio — commercials. Some stations may want to keep a music-on-cart operation utilizing these machines, but we play all of our music off CD.

With an AM/FM combo station, you will find that any cart can now be played in any machine. The playback, however, will be at the sampling rate and mode in which the cart was recorded. Additionally, any record amp can be plugged into any player and become a recorder. The two units do not need to be a matched set. The last machines in each of our on-air control rooms have a record amp attached.

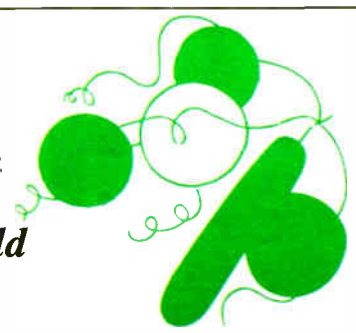
Any AT keyboard can be plugged into the record amp for remote control, titling the cart and other features. Two 24-character information positions are available on the player's LCD. In our operation, when the cart is inserted, the commercial title, length, spot number and run dates appear on the LCD. When the start button is pressed, the LCD shows the out-cue and the timer circuit starts counting down. Secondary tones are recorded in the usual manner and can be moved around with the keyboard.

Cueing and/or erasing carts can be accomplished in just a second. AES/EBU inputs and outputs are also included, but we have not got around to using them on a

continued on page 53 ▶

IT'S A GIRL!

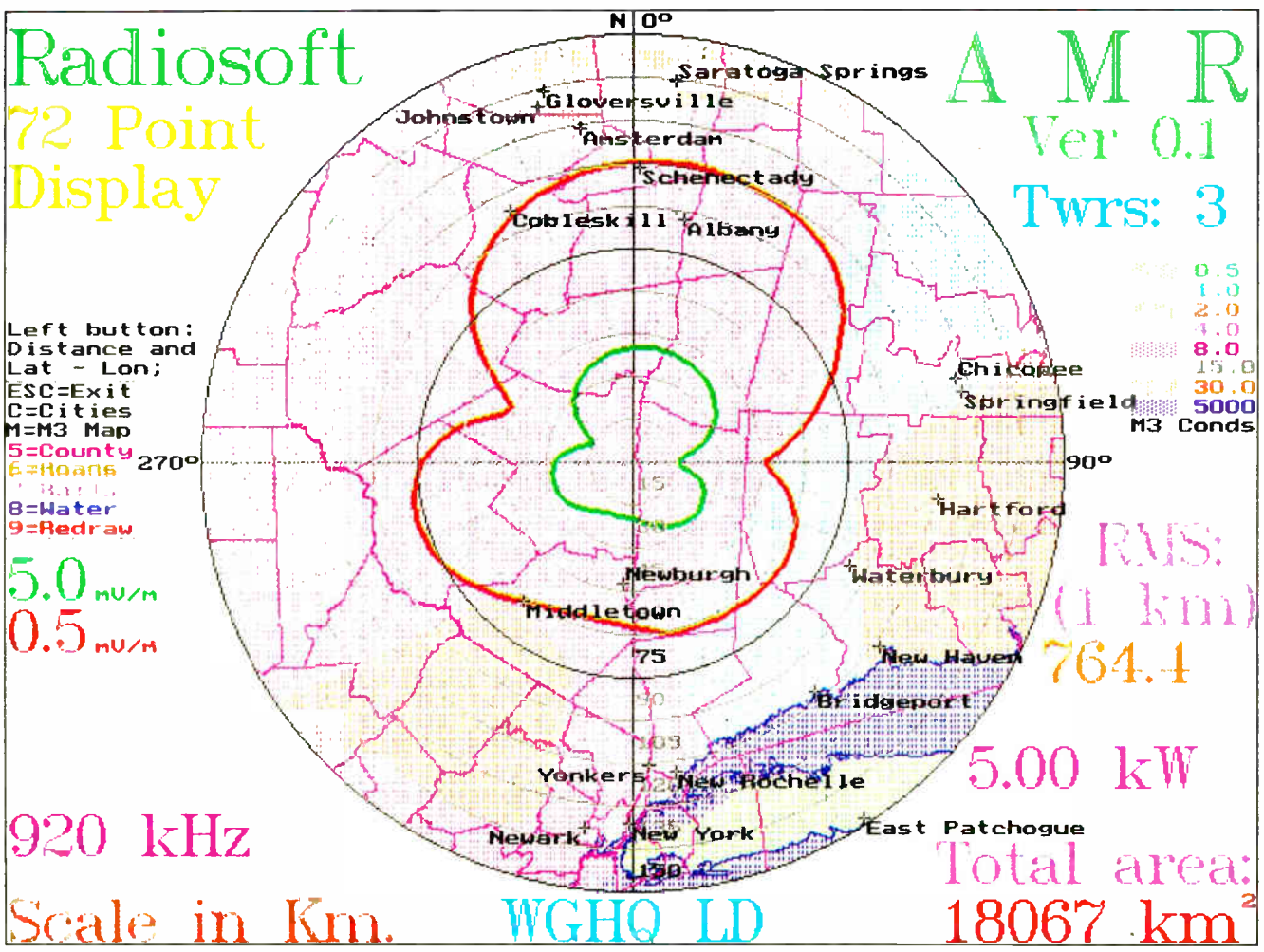
On September 1, 1995 at 9:58 a.m. in Edgewater, Florida a new life was brought into the world by Radiosoft.



After many months of labor, we are proud to introduce our newest, named AMR. She already knows so many things, too. And if you think that she will be the little stepsister of our popular FMR program, guess again! She's loaded with talent, and can already give her brother a good run for his money in speed and accuracy. She's even more fun to be with than he is, and you don't need a manual to play with her any more than you needed one for her brother. She knows all the standard, theoretical and augmented patterns, and can draw any contour you want, from wildly optimistic to "here's where you can really sell the station". Color pictures are easy for her, and she can make them any size you want. AMR is so smart, she can even draw a full color picture of the conductivity which makes the signal go where it does. She shares lots of her brother's toys, so you don't have to buy many new ones, and she plays the game just like he does, so you can win the first time you try her. And ANYONE can play, even if you have never tried a computer in your life, because she's the best behaved child in radio!

If you want to invite her over to your place to see what she can do, write us (120 North Riverside Drive, Edgewater, FL 32132), email (pmoncure@america.com), or just give us a shout at (904) 426-2521, and you'll like her as much as we do!

Here's one of her drawings (it took about 3 seconds to make):



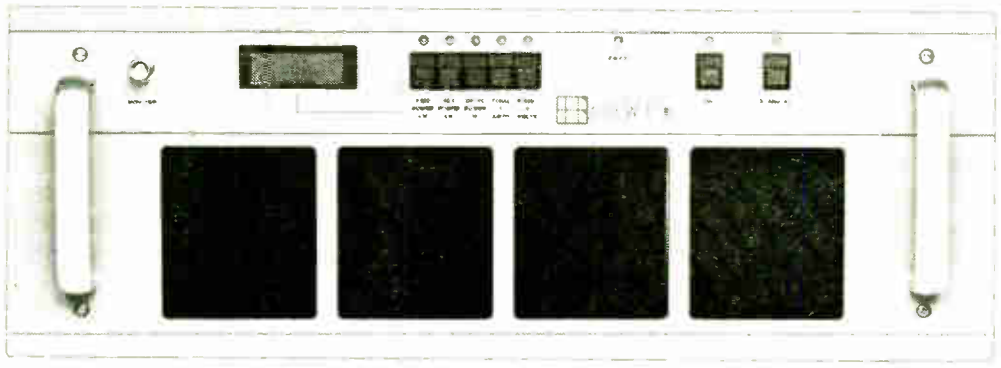
Fine print: any parent knows you have to give a little extra attention to the older brother when the new baby comes, so: if you mention "fine print" and you buy FMR before November 1, 1995, we will give you $100; if you buy both AMR and FMR, you get $200 (just so he won't be jealous).

World Radio History

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.

B-SERIES FM BROADCAST POWER AMPLIFIERS



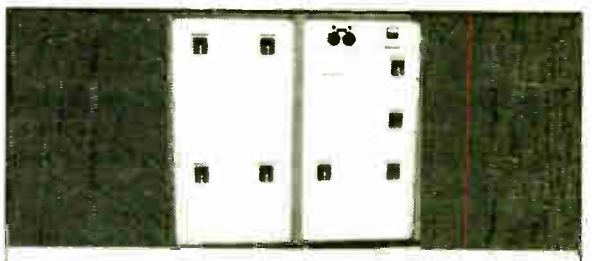
Reliability through design is the key to the B-series power amplifiers

Silicon Valley POWER AMPLIFIERS
The RF People

Silicon Valley Power Amplifiers, a quality supplier of OEM modules is now producing a range of compact power amplifers. All units are complete with rack slide ready to install in a 19" rack system.
Power outputs 150W to 1250W

For prices and delivery CALL 1-800-986-9700

READER SERVICE NO. 98



- CUSTOM ANTENNA PHASING SYSTEMS
- ANTENNA CONTROL SYSTEMS
- AM/MF ANTENNA TUNING UNITS
- DIPLEXERS & MULTIPLEXERS
- TRANSMITTER COMBINERS
- DUMMYLOADS (WITH MATCHING NETWORK)
- ASSOCIATED RF COMPONENTS
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WIRELESS IFB SYSTEM

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3CX2500F3	4CX1600U	5U4G
3CX2500H3	4CX3500A	6550B
3CX3000A7	4CX5000A	6550C
3CX3000F7	4CX10,000D	6AS7G
3CX10,000A3	4CX15,000A	6BM8
3CX10,000A7	4CX15,000J	811A
3CX10,000H3	4X150A	833A
3CX15,000A3	5CX1500A	833C
3CX15,000A7	5CX1500B	EL34
3CX15,000H3		SV811-3
4CX250B		SV811-10
4CX250BC		TH5-4
4CX250BM		TH5-6
4CX250R		TH6-3
4X350A		TH6-3A
4CX350AC		YC130/9019
4CX400A		8560AS
4CX800A		SK300A
4CPX800A		SK1300
4CX1500A		SK1320

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- Watch this list grow.
- Manufactured in Russia's largest power tube factory.
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- Honest prices based on quality at low cost.
- Shipment from USA stock.

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FAX: 205-880-8077	Int'l & US: 415-233-0429
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READER SERVICE NO. 122

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

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A Division of Howell Laboratories, Inc.

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READER SERVICE NO. 74

Get rid of your %$#@& patch bays and try this for a switch

Zercom CORPORATION

Do your audio routing through a Zercom Patch Switch system. Easy to install and use, a Patch Switch system provides you with front panel access to an unlimited number of input sources (by bussing units), Stereo or Mono selection, Phase reversal, signal summing, and a PCB that's set up for easy installation of audio pads. The enclosed audio switches have been tested to over 1,000,000 cycles for dependable performance.
And *best of all*... it's a Zercom product with a two year warranty.

The Zercom 'PS-2' Patch Switch $379.00

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218/765-3151-Fax 218/765-3900

Available through all major dealers

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Have your Eimac tube **REMANUFACTURED** by the trusted original manufacturer.

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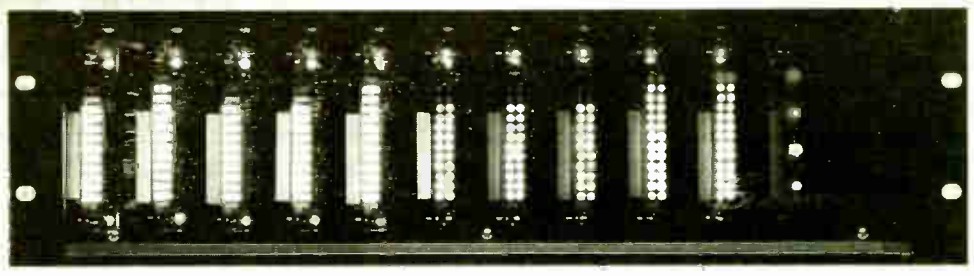
Available through
Richardson Electronics
(708) 208-2200

READER SERVICE NO. 70

Pull Listeners with the Finest Audio



The System 1000 Modular Audio Package
- Mono & Stereo Line Level Power DA™s
- Single & Dual Mic-Pre Power DA™s
- Remotely Controlled Daughterboards
- Mono & Stereo Card Edge Metering
- Redundant Power Supplies
- New - Instant Installation

The System 1000 delivers the absolute finest performance! All line level and mic-pre DAs use *Power DA™* outputs for a signal that just won't quit. Daughterboards provide remote gain and mode control, tone, voice overs, reverse IFB, and more. 10 additional modules, from a 4x4 mixing router to a 10 channel loss of audio alarm, make the System 1000 the tool for *your* needs. Like NPR and SMN, do wonders for your sound by investing in the finest. Call Rory Rall today.

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BENCHMARK MEDIA SYSTEMS, INC.
Phone 800-262-4675, FAX 315-437-8119

READER SERVICE NO. 192

RADIO CREATIVE THAT SELLS!

Creating effective radio commercials requires experience & an in-depth education. Finally, there is a complete course in radio creative...

With ***THE ESSENTIAL RADIO SPOT*** you'll have everything you need to know to create radio magic, including:

- *35 top experts on a 90 min. video*
- *75 great on-air spots on 2 CD's*
- *25 scripts for style and ideas*
- *150 pages of expert, step-by-step instruction.*

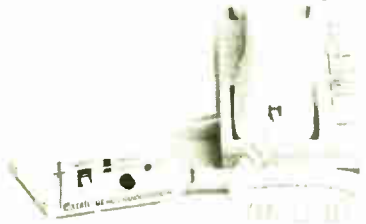
THE ESSENTIAL RADIO SPOT, *WILL PAY FOR ITSELF - THE FIRST TIME YOU USE IT!*

FOR CREDIT CARD ORDERS OR MORE INFO
CALL 1-800-336-3045

TO ORDER BY MAIL: SEND $249 PLUS $12 FOR SHIPPING & HANDLING (VA RESIDENTS ADD APPLICABLE SALES TAX) TO: RADIO WORLD - 5827 COLUMBIA PIKE, 3RD FLOOR, FALLS CHURCH, VA, USA 22041

READER SERVICE NO. 140

Excalibur Electronics
HC-1 Handi-Coupler



Here is the simplest, quickest, most convenient way to connect audio to a telephone. The HC-1 connects in series with the handset of any phone using modular connectors. *No* connection to the phone line is needed. Press the front panel button and external audio is available on separate send and receive 1/4" TRS jacks on the rear panel. Release the button and the handset is once more connected for normal use of the phone. Nothing could be simpler!

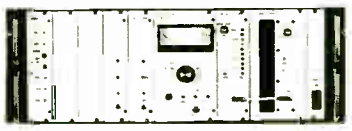
You can find many uses for the HC-1 around your station: on-air studio, production room, newsroom, sales office, field news kits, sports remotes, etc.

EXCALIBUR ELECTRONICS, INC., CHANTILLY, VIRGINIA
Please circle our bingo number for a data sheet and a dealer list

READER SERVICE NO. 5

Superior Broadcast Products

Designed and built to be the best 150 and 300 watt FM Transmitters



Standard Features:

- Frequency Agile lets you change frequency in minutes
- Overload Protection for Ref. Power, Current, Temp
- Remote Control Interface Built In
- Overload Led's for Ref. Power, Current, Temp
- LED Read out for modulation and deviation
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READER SERVICE NO. 68

World Radio History

KOSI(FM) Comfortable with DCR1000s

▶ continued from page 50

regular basis. Again, a button on the record amp toggles between analog and digital.

Simple servicing

Servicing the machines consists of blowing out the disc drives with canned air and cleaning the drives with a regular cleaning disk. We do this every week and it only takes about two minutes per machine.

The only problems we have had with the machines have been with the microswitches in the disk drives. On several occasions they have been literally bent out of shape. Once, we were able to bend them back into position. Another time we had to replace the drive, which takes about ten minutes.

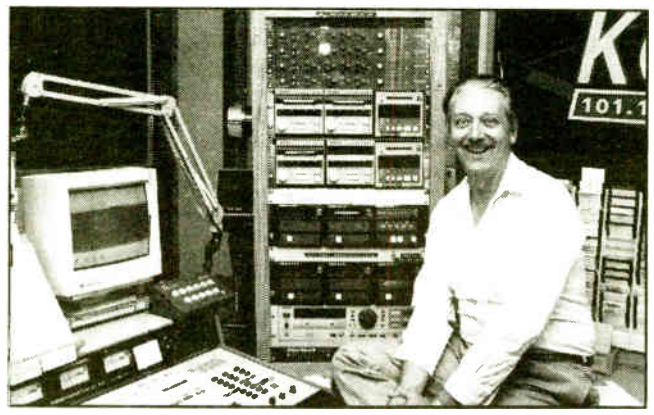
The disks themselves are more susceptible to magnetic fields than the old carts are. Early on we had numerous glitch problems that were a real mystery. Then one day while I was in the control room, I observed the DJ pull his next hours' carts, stack them next to the console, then remove his headphones and lay them on the stack of carts (go figure). The magnets in the headphones will do a number on the discs.

On another occasion, all of the machines and carts started glitching. A careful examination of the carts and machines turned up contamination of dog hair. It seems the late-night DJ had been bringing her dog to work with her. After the contamination was removed from the room, the problems went away.

All-purpose recorders

I have had the Dynamax DCR1000 cart machines in service in my FM station for three and one-half years now, and for the last year on the AM side. I have been very pleased with their operation. We use them for all our commercial playback and as all-purpose tapeless recorders. They have worked well in our production rooms and in concert with our multitrack editors. Nearly all of our commercials are broadcast without ever having been on tape. The only exceptions are a few agency spots that still arrive on those small reels.

I especially like the good service and customer support we have received from Fidelipac. The technical manual is excellent, with a full set of mechanical drawings, PC board layout sheets and complete schematics.



KOSI/KEZW Chief Engineer, Rodger Tighe, has been pleased with the DCR1000s' operation.

If you are considering changing from your current cart system to a newer media, you must decide whether to work gradually into the new media or to make the change in one sweep. Changing hardware is the easy part. The audio and remote control circuits are nearly the same and the wiring is already in place. Making sure that all of the digital carts are ready is the hard part.

Beehive of activity

In our case, we decided to make the changes in one sweep. I let our program director set a date a few months in advance when we could change over during an overnight period. This let the production department record as much material as possible ahead of time. During the last few weeks before the changeover, all new production orders were recorded on both analog and digital carts.

During the weekend of the changeover, the production rooms were a beehive of activity with the recording of last-minute spots, etc. As a precaution, I left one analog cart machine in the control rooms to catch anything that fell through the cracks. Out of nearly 800 carts, only a few did.

Our changeover went smoothly. The only thing I forgot was the fact that the digital carts do not store very well in the old cart racks. I had to have Fidelipac design some new digital cart racks for me.

□□□

For more information from Fidelipac, contact Dave Strode in New Jersey at 609-235-3900; or circle ***Reader Service 58.***

Marantz Gets a Chance

▶ continued from page 48

helping to answer our questions and smooth the implementation process.

A feature we immediately liked was the fader start input that allows the DJ to start a CD simply by bringing up the associated fader without having to reach over to the rack. Our ATI console did not have space available to implement this fader, so we instead connected one of the PMD321s to a push-button switch on the front of the console beneath the faders. A touch of the button activates the unit.

The balanced outputs of the PMD321 also provide level adjustment, another nice feature. During installation, this allowed us to adjust the unit in relation to the other faders on the console — it is set at mid-fader along with everything else.

The PMD321 has also proven to be very good in terms of error correction. It is very stable, with no skipping, and has also proven to be proficient at reading "foreign" discs without a problem.

Nice inclusion

A pitch/speed control allows adjustments in 0.1 percent increments over a ± 12 percent range. While this feature is more useful in production applications, we do have a couple of ambitious DJs who might use it during their shows. It is nice to have it included.

About the only thing we have found lacking is that while the auto-cue comes in handy, the auto-stop function takes some getting used to. If you pop in and pre-program a disc, there is no problem. If you vary from the pre-program, though, the auto-stop is overridden.

A little practice and common sense smooths this process. The disc can be ejected, reinserted and programmed again, ensuring auto-stop at the end of a track. The pause button can also be used in lieu of a stop button (not included in the unit) to stop output.

Overall, we have found the Marantz PMD321 to be a very good unit for broadcast while also offering features that make it attractive for production needs. Our DJs, the primary users, have not offered a negative comment. Particularly with the inclusion of the rare balanced outputs, the PMD321 is a value for any radio station in terms of performance and features.

□□□

For more information from Marantz, contact Hilarie Hackendahl in Illinois at 708-820-4800; fax: 708-820-8103; or circle ***Reader Service 138.***

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710 ENCODER: Just $995 and ***no computer required!*** The non-volatile memory holds 16 separate frames of program and format identifiers, alternate frequencies, radiotext messages and traffic or emergency flags. A built-in data interface lets you upgrade later to full dynamic operation for revenue-generating paging, GPS, coupons, contests, etc.

510 DECODER: Connects to your existing FM Mod-Monitor. The front-panel LCD display shows RBDS injection level and allows you to scroll through and read all the data groups. An RS-232 port gives unlimited access to raw RBDS data for telemetry and other in-house functions.

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Daily updating of **DATAWORLD'S** AM and FM databases protects against errors and omissions.

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WHO ARE YOUR LISTENERS?

1990 BUREAU OF CENSUS POPULATION COUNTING

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Circle (75) On Reader Service Card

World Radio History

Products & Services Showcase

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6db Louder?

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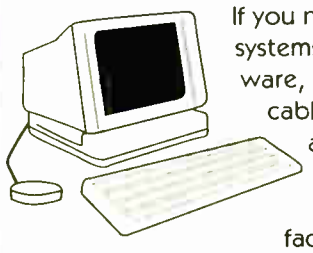
We <u>can</u> supply you with all of your computer needs!



If you need computer systems, hardware, software, memory, modems, cables, etc... for <u>ANY</u> application (on-air, sales, traffic, etc.) at your broadcast facility... call us!

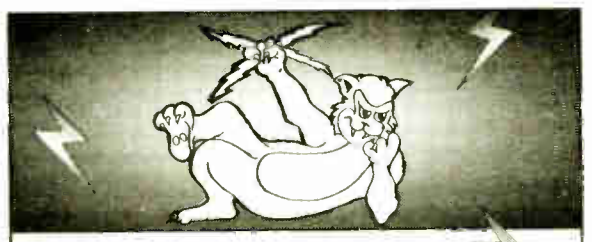
Broadcast Computer Distributors

WE KNOW RADIO

1-800-670-2743

(And use the money you save to buy that new processor you've been wanting!)

READER SERVICE NO. 144



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The CircuitWerkes DTMF-16 TouchTone Decoder

Inexpensive & Convenient Control

- Decodes all 16 DTFM tones.
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- Jumper selectable beep-tone acknowledges commands.
- Momentary or Interlocked Latching output modes.
- New, two-tone decoder & anti-falsing filter improve reliability & versatility.
- Combine with an AC-2 auto-coupler for an economical dial-up remote control.

The DTMF-16 is perfect for interfacing networks to your automation, controlling remote satellite receivers, repeaters, etc. With a list price of only $199, the compact, light & rugged DTMF-16 can be put almost anywhere to provide the remote controls that you need. For more info, contact your favorite broadcast supplier or call us.

CircuitWerkes

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Econco

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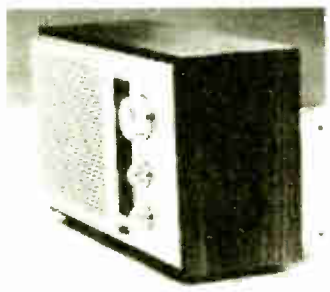
READER SERVICE NO. 213

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.

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- Eliminate bad room acoustics
- Hold absolute levels
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READER SERVICE NO. 167

World Radio History

Safe with AudioVault

▶ continued from page 45

The second feature was that BE made the system easily expandable. They added network capability and used the Microsoft Windows for WorkGroups platform which is widely supported, easy to use and inexpensive to obtain.

Now for the great part. You can have from one to seven cards in a server, each of which gives you one record/playback capability. The system uses standard SCSI drives for program storage. The larger-capacity drives are widely available at a very attractive price.

If you need more cards, you add more servers. BE thought about that too. In this age of duopolies, that is certainly an advantage over starting from scratch with a new system when a new facility is acquired.

No more cart duplication

BE also has a transparent method of moving files around the network, making it seamless to the user. If you record a spot on one system, it magically appears on the other in just a few seconds real-time. When an element is loaded into the system, it is available for all users. Duplication of carts for two stations is no longer necessary.

Changes are very easy to make. Even though we do not use the same cart numbers on both stations for every duplicate, this was very easy to handle. We still only have one copy of a cut — we just call it two different things. AudioVault is a versatile and time-saving device.

One of the great advantages of the system is its use of distributed storage. You can have files stored anywhere you want; even in a workstation. We store files in five locations: each air studio (as a redundant back-up), as well as three servers. Storage is done automatically each time a cut is recorded.

Not every cut is sent to every storage area. Only those items we have deemed necessary are stored in all locations and they are totally user-definable, cut by cut. This allows us to reduce the size of the hard drives in the workstations and subsequently keeps the cost lower.

Simple file transfer

The file transfer system makes duplicating and deleting files simple. We can lock certain workstations out of the delete process simply by changing a statement in a parameter file. If we want, once a commercial has been deleted, it is deleted from all the servers automatically. In some cases, we delete it from one system and archive it on the other for seven days just in case we made a mistake or the client buys another flight.

We store commercials, liners, promos, jingles, playlists and station IDs in the workstations. In the event of a catastrophe — say an earthquake such as the one Los Angeles had — we stand a pretty good chance of getting our air product out of the building and transporting it to our emergency location. Just grab the computer and run.

We recently installed AVAir, which is BE's latest addition to the AV-100 software enhancements. This is a live-assist screen which can do double duty as a standalone automation system. We installed the system just before the NAB convention and it has been running ever since. The operators had one of those quick 10-minute lessons and I was off to the convention. It was so easy for them to understand and operate that they figured it out by themselves.

The facility that uses AVAir runs live from 6 a.m. to 7 p.m., runs unassisted from 7 p.m. until 6 a.m. during weekdays and is totally unassisted on weekends. Everything is loaded over the network — music and promos as well as spots.

I feel in this instance that BE has more than delivered the product they promised me.

Generate daily playlists

We even get the reconciliation logs for traffic and music over the network. Daily playlists are easily generated because AVAir, as well as the AV-100, interfaces easily with all music schedulers and traffic systems capable of exporting a text file.

Even in this area, BE has continued to develop the software. We just installed AVAir version 2.0 and have found more features, including touch-screen compatibility. BE has continued to upgrade the software since its inception.

I have seen many revisions; some very useful, others not too useful. Some were implemented simply to cure bugs found by users. A few noise problems we experienced caused by something in the software were fixed by one of the BE revisions. What we have now is a very workable and reliable system.

AudioVault has shown that it is reliable and robust. We have never lost a system file unless someone deleted it. In some cases we have even used AudioVault to make our hook tapes for research. What took days and weeks is now generated in a couple of hours. The productivity issue certainly cannot be overlooked.

Superb audio quality

The audio quality of the system is superb in uncompressed mode. While some degradation of the audio does occur in the compressed mode, the degree to which it is obvious is directly proportional to the amount of compression used. We use a 3:2:1 compression ratio on most things.

BE uses the MPEG compression scheme — the same used by ComStream on its satellite system. Many systems are adopting the MPEG standard, so I do not think anyone has to worry about it going away anytime soon.

The interface for remote control is accomplished by using what BE calls a BEI card, which I can only assume stands for Broadcast Electronics Interface. This card is essentially a heavy-duty parallel port structured to handle 12 V with a fair amount of protection. The card allows the user to interface the AudioVault to external buttons, relays, switches, lights, etc. Because this card uses what is called "mapping" for functionality, it can be configured for many different functions.

BE has chosen to make AudioVault parameter-driven. This means all kinds of changes can be made to the software from an external file. These changes can be anything from screen appearance to special functions such as recording the network news for playback at a later time.

Someone might need it

BE even put a time announcer inside AudioVault. I thought that was a bad idea 10 years ago in the analog mode and I have not changed my mind today in the digital domain. The point is that someone might need it, so they allow you to have it.

The way BE drives the AudioVault functionality is through a standard Microsoft Windows INI file. For those of you who have ever looked at an INI file in Windows, you will get the message right away. This file controls virtually everything in the Vault.

AudioVault did not come without some headaches. The installation was straight-forward enough; however, determining how to get the configuration we wanted took some time. BE helped us along the way. Problems? Sure, we have had a few. But in each and every case BE has responded quickly with real fixes, not just empty words.

Quick, convenient help file

One note I will caution perspective purchasers about is the manuals. BE provides two rather large notebook affairs describing the system. I found them to be almost useless. While there is plenty of documentation, it is hard to read and accomplish the tasks at the same time. I found the software manual, otherwise known in Windows as the HELP file, to be much more understandable and user friendly than the manuals. In fact, it is much more convenient and quicker to find things in an on-line, context-sensitive manner.

The latest hardware addition is what BE calls a daughterboard. This board attaches directly to a standard AV-100 card and provides two additional playback channels from a single standard card. With this addition you can now have three playbacks on one card; a practical and cost-effective solution to many configuration situations.

While being a pioneer, you can frequently end up shot full of holes. I feel in this instance that BE has more than delivered the product they promised me. No, it was not always this way and yes, sometimes it took a little longer than I would have liked to fix a bug. The bottom line is that I can honestly say they have responded as well as, or better than any broadcast manufacturer I have dealt with in 25 years.

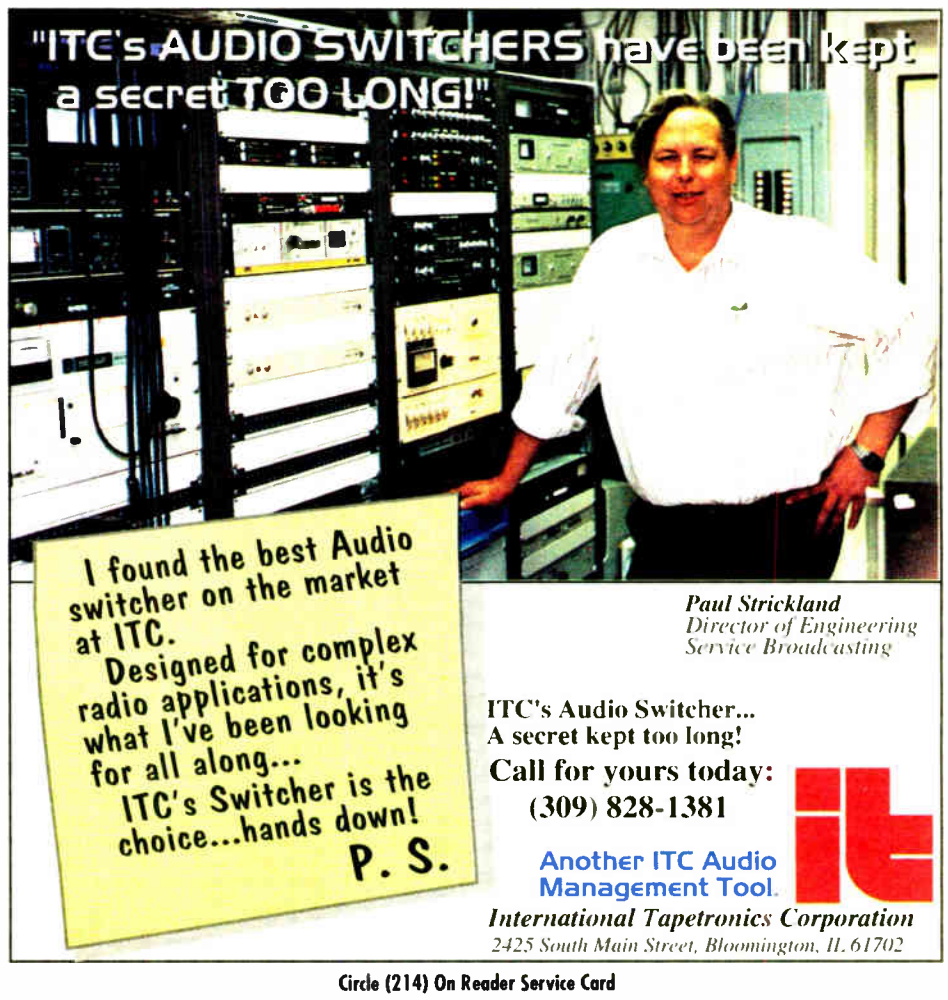
Six stations, one facility

We are adding two more servers to our Los Angeles facility to accommodate CRC, which is our news network. Our Las Vegas station has been on-line six months, the Chicago station will go on-line next month and the Miami system is being configured as this is being written. Dallas has a "starter" system for one station which will be expanded to include the other five stations. Yes, six stations operating from one facility and one AudioVault is the goal for early 1996.

By the way, our New York station should be moved and ready for its AudioVault in the first half of 1996. I hope that answers all the questions anyone may have about my faith in the performance of the product.

□□□

For more information from Broadcast Electronics, contact Bob Arnold in Illinois at 217-224-9600; or circle ***Reader Service 92.***



Circle (214) On Reader Service Card

World Radio History

USER REPORT

NSM 3101 Jukebox Holds It's Own

by Eric Hanson
Director of Engineering
Hanson Communications Inc.

PORT HURON, Mich. The NSM 3101 is a mechanical jukebox that maneuvers, holds, cues and plays 100 compact discs. This "black box" contains two CD magazines (each holding 50 CDs), one solid transport mechanism that runs vertically between the magazines, one CDM-4 that houses the motor, laser and optics, a power supply, the control circuitry that relates to the outside world and the internal control circuitry. This box, as I understand, was originally designed for high-end consumers in Germany and for use in jukeboxes that are found in bars and pubs.

More than four years ago, I attended the Las Vegas NAB to purchase automation systems for WPHM(AM) and WBTI-(FM). I spent several days reviewing systems and comparing options and prices. As a result, a purchase was made through Dave Scott of a Novell network system. At that time it was the only network system on the market, and since then I have enjoyed watching many appear.

I spent several days reviewing systems and comparing options and prices.

I had the option to use either Sony 60s or the new NSM 100s. The price for three NSMs was slightly more than that of four Sonys, and there was a rumor of a 300 CD box coming from Pioneer. My decision was to go with the three NSMs for WBTI. I had heard of possible jamming problems with the Sony boxes and having three boxes would give us the redundant system that a single box would not offer.

When the NSM 3101s arrived, I found analog outputs using unbalanced RCA jacks and unbalanced XLRs. I was not afraid of signal degradation because the cable lengths would be less than 10 feet, but I was afraid of low drive levels. When the NSM 3101s were connected to our Ramko switchers, we had plenty of signal level. If I was going to make long cable runs from these boxes, I would have purchased ATI adaptor boxes, but this installation did not need them.

No maintenance time

The three NSM 3101s were put on the air in 1992 and worked flawlessly until the third quarter of 1993. I put no maintenance time into the boxes and had enjoyed watching them work week after week. I was therefore surprised to get a call around 6:30 a.m. from our FM morning talent. He told me that one of the jukeboxes was not cueing up. I was happy to have two other boxes on-line (single-jukebox operations beware).

I tried to cue up a song in the "uncueable" jukebox. The correct disc was pulled, the transport worked flawlessly, but the disc did not spin correctly. I removed power from the box and manually lifted the transport from the CDM-4. There was a small cylinder stuck to the platter that the CD rests on. This cylinder was a magnet that needed to be in the cap on the transport. The magnet pulls the cap down, pinching the CD between it and the platter. I put a drop of super-glue on the magnet, pushed it back in the cap, waited a couple of minutes and returned power to the box. The first CD cued without a problem and the box has been functioning fine ever since. The repair took all of 15 minutes.

During the last quarter of 1993, the decision was made to get jukeboxes for WPHM. I decided to go once again with the NSM 3101s. I purchased four and got them on-line quickly. After 10 months, one of the four new boxes was not cueing correctly. This time I could not find a visible reason for the problem. I called NSM and they suggested the CDM-4 was bad. I was sent (via Fed Ex) the new CDM-4 (at no cost, thanks to the warranty) and had the box up and running the next day.

Changing the CDM-4 took me 20 minutes. Having done it once, I expect it will only take just over 10 minutes to change one again. The station was able to stay on the air without any problems overnight using the remaining three NSM 3101s.

Since I purchased the original three NSM 3101s, several manufacturers have come out with 300 CD players with two-play decks in one box. One of these boxes has to be loaded and unloaded by its transport one CD at a time. This takes a lot of time.

Valuable time-saver

I am happy that when our STL cable was snapped from high winds and we had to broadcast from the transmitter site, I did not have to wait for a transport to give up our music library one CD at a time. I explained to our afternoon talent how to pull the magazines and he met me at our transmitter site (30 minutes from our auxiliary studio) in just over 40 minutes. He brought our entire library out to the transmitter site protected in the magazines.

continued on next page ▶

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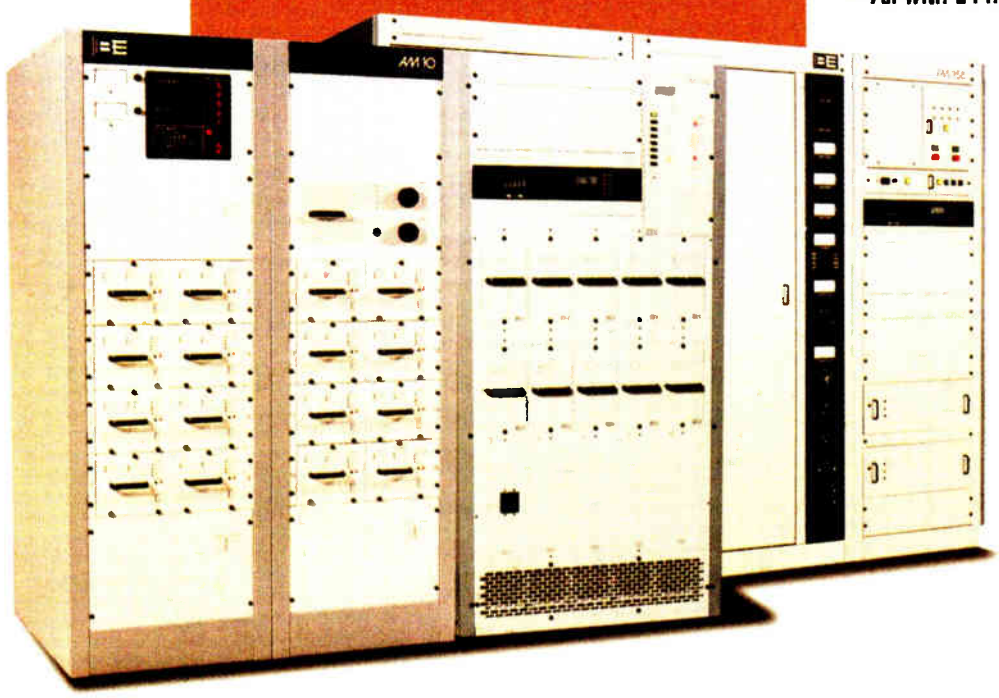

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Circle (206) On Reader Service Card

World Radio History

Amateur Radio Thrives

▶ continued from page 41

These special-interest networks cover just about every area of human endeavor. You will find swap-and-shop, current events, vintage radios and operators, UFOs, shortwave and scanner listening, user workshops, computers and dozens of other topics.

Through the grapevine

Every night can be an education in world affairs from the perspective of real people, not talking heads. The difference between events reported through "official channels" and by amateur radio is striking. Many times the amateur grapevine is weeks, months, even years ahead in accurate reporting. Ham radio is a sort of Internet with a soundtrack.

Then there are the casual groups congregating on certain frequencies most days and nights of the week. The effect is of a local watering hole without the booze. The 75-meter band is particularly famous for this phenomenon.

With only a few exceptions you will be able to check in with these groups for casual chit-chat. But be warned: entering a few late night groups could be like inadvertently stumbling into a biker bar. You will be lucky to exit with your dignity intact. Listening before jumping in is highly recommended.

Every group has its own flavor, pecking order and etiquette. Even if you never get a license, listening itself can be a hobby. Some nights the antics on the ham bands can be as entertaining as what is on the broadcast dial. This is probably due to a substantial number of broadcasters being more candid than during working hours. No clock, no boss, no constraints.

Why do it?

A casual observer may wonder why a person who toils in the vineyards of broadcasting would spend free time behind a mic or poking around inside a transmitter. I think part of the reason is analogous to comedians wanting to play straight parts or dramatic actors wanting to do standup comedy.

The engineer who maintains the station transmitter may harbor a secret desire to kibitz with callers during drivetime. The well-manicured DJ may privately wish to tinker with RF and high-voltage. In the context of one's own radio station, all things are possible and are limited only by imagination and the laws of physics.

The influence of broadcast and audio pros in ham radio has already forced the issue of quality signals heard on the amateur bands. Manufacturers have incorporated digital processing and even equalization for transmitted audio. Converted AM broadcast transmitters and peripherals have been responsible for a renaissance in audio quality.

Dial in the 75 or 160 meter band one night and you may hear stations that rival or surpass the quality of some commercial broadcasters. Now that is synergism.

RW's main mission is the relentless commitment to bringing important information to the broadcast professional. Amateur radio is a meaningful dimension of many broadcasters' lives. In the months to come, this column will explore that dimension.

Radio mainly for the love of it.

□□□

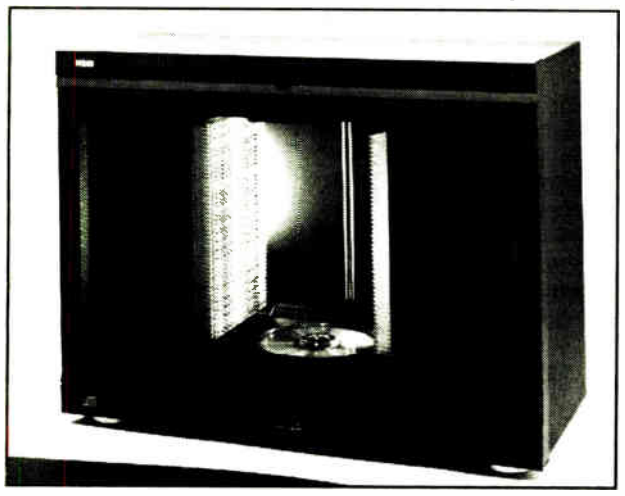
Al Parker writes on ham radio and photography. He can be reached on the ham bands by calling N2SAG, or by phone at 516-681-6733.

100 CDs for NSM

▶ continued from previous page

I have made a couple of modifications to our NSMs that most broadcasters would find helpful. The first is disabling the "safety" that shuts the jukebox off when the front glass is open by just pulling a connector off a back panel. This allows access to all of the CDs in the juke-box while one CD is playing and helps keep the MD from killing a song on the air.

The second modification is replacing the timing crystal to increase the pitch of the jukebox. The crystals can be custom-ordered through Jan Crystals to increase speed by as much as five percent. Once you have done it, the time it takes to change a crystal is under 15 minutes per box.



NSM 3101s have provided over 100,000 hours of jam-free service for Hanson Communications.

The NSM 3101 is a "pro-sumer" device that needs serious consideration when installing systems calling for large CD-library access. The main problems are no balanced analog outs (but lots of drive from the unbalanced ones) and no cue-to-music (this feature is not missed that much but would make the box more "pro" than "sumer").

Strong positive points

The strong positive points include built-in redundancy (ease to stay on the air) when purchasing two or more units, easy human access to the CD library, low maintenance, fast repairs through component swapping, excellent tracking from the laser and optics and a transport mechanism that was built for jam-free service.

I have logged over 100,000 hours with the seven boxes at Hanson Communications and have yet to have a NSM 3101 jam.

□□□

For more information from NSM, Contact Jon Taylor in New York at 516-273-4200; or circle ***Reader Service 190.***

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Company	Media	Length/Size
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Ampex 340 Parkside Dr. San Fernando, CA 91340 818-365-8627	Analog Open Reel Digital Open Reel Digital Audio U-Matic Cassette DAT Hi-8 ADAT	Numerous sizes and lengths 1/4", 1/2" and 1" 30, 60, 75 and 83 minutes 15, 30, 46, 60, 90 and 120 minutes 60 and 113 minutes 42+ and 60 minutes
Denon 13825 Cerritos Corp. Dr. Suite B Cerritos, CA 90703 310-404-0200	Cassette DAT CDR	60, 74, 90 and 100 minutes 20, 60, 90, 120 and 180 minutes 63 and 74 minutes
Maxell 22-08 Route 208 Fair Lawn, NJ 07410 201-794-5900	MiniDisc Cassette DAT CD-R	up to 74 minutes 20, 30, 60 and 90 minutes 34, 49, 64, 94 and 124 minutes 63 and 74 minutes
TDK 12 Harbor Park Dr. Port Washington, NY 11050 800-TDK-TAPE	CD-R Cassette MO	80 and 120mm; 18, 21, 63 and 74 minutes 30, 50, 60, 90, 100, 110, and 120 minutes 3.5", 5.25"; 128 MB, 230 MB, 650MB and 1.3 GB

World Radio History

RadioWorld

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AMPLIFIERS

Want To Sell

Denon DRA-400 tuner/amp, beautiful enclosed display w/rosewood trim, exc condition, $150. Ray, 941-923-8239.

Gates GTM-88R RF amplifier, $50. B Preston, 503-947-3351.

Russco FMSU stereo TT preamp. D Bailey, Rock Shoppe Prod, 10027 Church Rd, Dallas TX 75738. 214-343-0879.

ANTENNAS/ TOWERS/CABLES

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1983 Jampro LP-2-bay, good low-cost low power 2-Bay antenna, FOB, Yreka, CA, $1250. Fred Missman, 916-842-4158.

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Andrew 87 N 1-5/8 coax to N female connector, $50. R Sweatte, 509-586-8625.

ERI 4-bay FML Series Rototiller on 104.9 MHz, max input 9000 W, end fed, leg mounts, comes with stub for lightning protection, 25% off new price/Best Offer. E Joe Eck, Eagle Broadcasting, Box 69, Abilene KS 67410. 913-263-1560.

Shively 6602 4 bay hor on 100.1 MHz, will handle 1 kW input, never used, $1900/BO. D Michaels, KZRO-FM, POB 1234, Mt Chasta CA 96067. 916-926-1332.

Scala CA5-FM yagi, (4) cut to 98.3 MHz, very broadband, used on 96.7 MHz, $200 ea; Scala CA5-FM-EB, (4) 5-element yagi, rear mount, 9 dDd, $200 ea; Scala PD4-2222 power divider, 4 output ports, $100. D Magnuson, 423-525-6358.

525' of 3" transmission line; ERI 6-bay FM antenna with radomes. J Paleski, 201-228-4900.

Andrew 87N 1-5/8" coax to female N connector, $50. R Sweatte, 509-586-8625 phone/fax.

Andrew 1-5/8" rigid coax up to 360', BO. J Whatley, WNUZ, 110 Glenhaven Dr, Alexander City AL 35010. 205-234-2492.

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Cetwave 2-bay antennas tuned to 107.7, $1000; 250' 84147 Andrew LOF7-50A Heliax coax, foam filled, 1 connector 1-5/8" to type N, $1000. G Quinn, WMRS, 132 N Main St, Monticello IN 47960. 219-583-8933 or 513-399-7250.

Complete 4 tower, 5 kW audio chain & monitoring, ready to move & go on the air, $25,000 without towers, $30,000 with towers. For additional fee will move to your site, equipment now on air & can be inspected, transmitter can easily be converted to 10 kW. CE Jones, (former WMNY), 109 Mauve Ln, Eutawville SC 29048. 803-492-7613.

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Jampro MJPC-3R 2 bay FM, 4 yrs old, excellent condition, tuned to 105.5, removed for frequency change, $1200 +shipping. K Bryant, Seneca Broadcasting, 73 E Main Box 610, White Sulphur Springs WV 24986. 304-536-1310.

Rohn BX40 40', new, $250. C Ratliffe, Long Pine Broadcasting, 325 N 6th St, Albermarle NC 28001. 704-982-6141.

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New 1200' 2.25" Andrews air heliax with fittings, dehydrator, ground kits and hoisting grips. 919-781-3496.

Want To Buy

300-500' & 100 or higher self supporting tower. P Lopeman, 414-482-1959.

FM antenna on 104.3, 1, 2 or 3 bay, low price, for back up antenna. P Deen, WAJQ, POB F, Alma GA 31510. 912-632-1000.

High power FM antenna on or near 107.1 FM, prefer 8, 10 or 12 bay. B Michaels, Unique Bdctg, Bay City TX. 409-244-4170.

Six bay FM antenna for authorized power increase (99.3), cheap. M Coburn, KTOX, 520-855-9000.

500' radio tower, Midwest Bible Radio, Sioux City IA, 712-252-4621.

Utility 340 (pipe leg) needed, 280' 2 base sections, 1 base insulator. T Callahan, POB 190411, Boise ID 83719. 208-866-1791.

AUDIO PRODUCTION

Want To Sell

ABC 32T pulsing unit, $100. B Preston, 503-947-3351.

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Linn Drum classic drum machine w/MIDI update, $100; Adams-Smith Zeta III-B synchronizer w/cables for JH-24 & JH-110 recorders, recent software, $950; Barcus-Berry 202-R sonic maximizers (2), rack mountable. Mark, 512-472-8975.

Spectro Acoustics 210 stereo graphic EQ, 10 bands, $85; Furman LC-2 comp/limiter w/de-ess, adjustable attack & release, $300; dbx-2-124 NR system, $70; Teac AN-180 NR unit, $65; Realistic stereo graphic EQ, 5 bands, $35; Archer 15-278 video sound processor, $35. D Jackson, WQQQ, Wilton, CT. 203-762-9425.

Turtle Beach 56K digital editor, 56K hard disk editor, fast & great sounding workstation for PC, 1 yr old, $850. Keith, 504-595-8623.

Valley 400 mic processor, $400. M Rollings, 314-968-4212.

Digidesign Audiomedia II stereo hard-disk rcdg card for Nu-Bus MacIntosh; stereo analog/digital I/O, w/Sound-Designer II software. Mike, Trinity Recording, 904-439-3671.

dbx 166 stereo compressor, $350. W Gunn, 619-320-0728.

Pultec MEQ-5 mid range EQ, tubes good condition, $1000. Joe, JCF Labs, POB 184, Lincoln City OR 97367. 503-994-9023.

Lexicon 200 digital reverb, algorithms from 224XL, mint cond, studio high-end, $1200. Mike, Trinity Recording, POB 2479, Flagler Beach FL 32136. 904-439-3671.

Linn Drum classic drum machine w/MIDI update, $100; Adams-Smith Zeta III-B synchronizer w/cables for JH-24 & JH-110 recorders, recent software; Barcus-Berry 202-R sonic maximizers (2), rack mountable, $75. Mark, 512-472-8975.

McMartin TR33C multiplex tuner, $50. C Ratliffe, Long Pine Bdctg, 325 N 6th St, Albermarle NC 28001. 704-982-6141.

Valley PR-10 powered studio rack w/6 Kepex II, (2) Gates sibilance processors, (2) Levellers, (2) Maxi-Q parametrics, $1800. Mike, Trinity Recording, POB 2479, Flagler Beach FL 32136. 904-439-3671.

Zercom Max-Z-II used eight months, mint cond, w/case & mic, $475. S Alexander, KQXI, 2700 S Platte River Dr, Englewood CO 80110. 303-783-0880.

Want To Buy

SAE 5000 Impulse Noise Reduction. 800-211-3999.

AUTOMATION EQUIPMENT

Want To Sell

Computer Concepts 8x4 switchers (4), $1800 ea; (2) Sentry Systems Air Sentry silent sensors, $150 ea; Gentner silence sensor, $300. M Rollings, 314-968-4212.

ITC 750 & 850 PB, SMC 450 stereo Carousels, Format Sentry brain & cables, Instacarts 48-tray mono, SMC 250 Carousel, mono, BO/trade considered. R Wells, KSRO, 1410 Neotomas Ave #200, Santa Rosa CA 95405. 707-543-0146.

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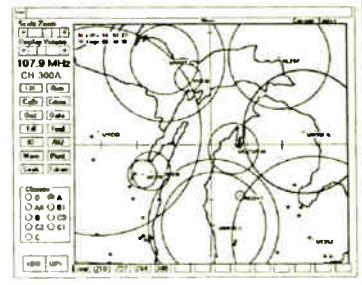

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Sentry FS-12B complete automation system in good condition with 2 stereo 48 insta-cart, 4 stereo Go-Carts, (2) 24's, (1) 48's & (1) 42, computer, interfaces, manuals & cables, currently in use. C Mandel, KWST, Box 1018, El Centro CA 92244. 619-352-2277.

SMC DP-2 automation, 4 Carousels, 5 reel to reels; (2) SMC ESP-1 automation units, 4 Carousels, 4 reel to reels; SMC MSP auotmation, 3 Carousels, worked fine when replaced in 1994/5, all 4 units delivered to your Mainland USA site, $6250. SBC, 600 N. Kiwanis, Sioux Falls, SD 57104. 605-334-1117.

Sola transformer, 208-250 Volt to 118 Volt; Ampex PB amp/speaker, suitcase style, tubes; enclosed switch 100 amp 3-pole, Best Offer. R Wells, KSRO, 1410 Neotomas Ave #200, Santa Rosa CA 95405. 707-543-0146.

IGM-EC complete automation system in good condition with 3 stereo Instacart 49's, 1 stereo Go-Cart 24, computer, interfaces manuals & cables, currently in use. C Mandel, KWST, Box 1018, El Centro CA 92244. 619-352-2277.

Sonomag ESP-1, complete system, (3) model 350 Carousels, silence sensor, (3) reel to reel, computer, excellent condition, $4000. L Mariner, 210-775-9583.

IGM-EC automation system with 8088XT, SMC 350 Carousels with 72 cart capacity with Shaffer controllers & monitor amps, good condition, $3500. 503-223-6769.

CART MACHINES

Want To Sell

ITC Delta - new pinch rollers: Mono playback (2), record/play (2), stereo record/play (1). MOTIVATED! Spotmaster series 2000 record (1). Wes, 818-798-9128.

Tapecaster X-700 mono R/P w/auxiliary tone generator & detector, $500. R Franklin, Super Sound Studios, POB 1, Norristown PA 19404. 610-279-4515.

Tapecaster X7800RP & 700s, all in good to excellent condition, $100-$495. A Ishkanian, Focus on Truth, 1802 Hilliard Rd, Richmond VA 23228. 804-262-4330.

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CART MACHINES...WTS

Tapecaster 700-P old style, $400; Spotmaster Ten-70, has rapid recue feature, motor recently rebuilt, $350, w/manuals, we'll pay shipping. Andy, 315-696-6550.

BE stereo R/P, excel cond, $600. G Mininger, 719-632-3536.

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ITC Series I, $1200. M Rollings, 314-968-4212.

ITC triple deck w/record module (stereo), like new, $1200: BE triple deck w/record module (stereo), gd cond, $1000; (2) Omega single play machines in gd cond, $500 ea. Dave, KDEA, 318-257-7523.

Tapecaster 700-P, $400: Spotmaster Ten-70 w/rapid recue feature, recently rebuilt, $350. Both units used only seasonally 4 hrs/day, stored summers, w/manuals, we pay shipping. Andy, 315-696-6550.

BE 900 R/P in mint cond, low hrs series 3000, $1150. C Varecha, Peak Teleprod, POB 3004, Vail CO 81658. 303-845-7811.

Tapecaster X700RP & 700s, all in good to excellent condition, $100-495. A Ishkanian, Focus on Truth, 1802 Hilliard Rd, Richmond VA 23228. 804-262-4330.

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Want To Buy

ITC, BE, Fidelipac cart machines: single, triple, mono, stereo, play & record/play. Call M O'Drobinak @ 619-758-0888.

CD PLAYERS

Want To Buy

Denon 950FA, working or not. P Lopeman, 414-482-1959.

COMPUTERS

Want To Sell

IBM PS/2 mdl 30, 286 machine ISA bus 1.4M floppy, 30M hard drive, 1M memory, BO/trade. P Cibley, 212-532-2980.

PC clones (6), 486 computers in several configurations, desk & tower, ram from 512K to 16MB, hard drives from 44MB to 2.3 gig. R Franklin, Super Sound Studios, POB 1, Norristown PA 19404. 610-279-4515.

Want To Buy

Tandy 6000 HD with at least one floppy drive. Mel Crosby, 408-363-1646.

CONSOLES

Want To Sell

Altec 1567A tube-type mike mixer w/meter (vintage). $350; Yamaha RM-804 recording mixers. 8 channels, $400; Shure M-68P mic submixer, $70. D Jackson, WQQQ, Wilton, CT. 203-762-9425.

McMartin B-1082 8 chnl stereo, 18 inputs w/manual, excel cond, $750. R Rocks, KEMC, Billings MT. 406-657-2941.

Otari 50/50 BIII, 2 track, like new. $3800; Panasonic 3900 DAT w/controller, like new. $2250; Yamaha SPX900 effects reverb, like new, $700. J James, 310-824-4846.

Shure mixer, $600; 2-line Comrex, $2100. T Balistreri, 414-784-2863.

Ampro AL-10D 10 channel, each has 4 aux inputs, dual channel mono out, self contained power supply & monitor amp, manual, very good condition, $425. D Nuechterlew, WUCM TV 19, A-93 Delta College, University Ctr MI 48710. 517-686-9341.

Audioarts Wheatstone 8x console, configured 32x8x2, 4 aux sends, 3 band parametric EQ, built in TT patchbay, direct outs on all channels, 24 track metering, external power supply, spare channel, console stand, custom oak overbridge for rack mounted gear, $5000/Best Offer. Steve Wytas Productions, W Hartford CT 06110. 860-953-2834.

Gates Dualux, tube type, worked when removed, manual, $600. C Buckley, KXO, 420 Main St, El Centro CA 92243. 619-352-1230.

Gates/RCA Executive President BC7-A solid state; Gates Executive 10 channel stereo & a Gates President 10 channel mono, both in mint condition, $200-750. F Roberts, KUT-FM, CMB 3.142 Univ of TX, Austin TX 78712. 512-475-9069.

Gates M5133 Gatesway console, working when removed, spare pwr supply & manual, $300. D Wilkerson, WLIK, 640 W Hwy 25/70, Newport TN 37821. 423-623-3095.

Harris Gates Yard II 8 chnl mono board, solid state, needs work BO. D Nuechterlew, WFLT, 6130 S Dehmel Rd, Frankenmuth MI 48734. 517-652-6863.

Langevin AM-301, 12 mono inputs, stereo output, cue buss, effects buss, BO/trade. R Wells, KSRO, 1410 Neotomas Ave #200, Santa Rosa CA 95405. 707-543-0146.

McMartin B-1082 8-channel stereo, 18 inputs with manual, excellent condition, $750. R Rocks, KEMC, 1500 N 30th St, Billings MT 59101. 406-657-2941.

Quantum 12-P, 6 stereo inputs, 6 mono inputs, 4 output busses, cue detents, buss & amp, vgc, some noisy switches, $2000/BO. R Wells, KSRO, 1410 Neotomas Ave #200, Santa Rosa CA 95405. 707-543-0146.

Shure mixer, $600; 2-line Comrex, $2100. T Balistreri, 414-784-2863.

Sound Tech ST 164 16x4 mixing board, like new, $1100. D Huettner, Dynamic Sound Studio, 358 W Bell St, Neenah WI 54956. 414-722-7228.

DOD 1642 mixing board, rack mount, low use, $600. 800-211-3999.

Gates Yard board, new tubes, $395. W Gunn, 619-320-0728.

Want To Buy

Manual/schematic for Quantum QM-22 console. M Craft, 941-954-1280.

Spare cards for an Auditronics 110, specifically 1ME & SpF4. D Webb, KESY, 4807 Dodge St, Omaha NE 68132. 402-556-6700.

Spare cards for Auditronics 110, specifically 1ME & SpF4. D Webb, KESY, 4807 Dodge St, Omaha NE 68132. 402-556-6700.

DISCO-PRO SOUND EQUIPMENT

Want To Sell

EV MS-802 monitor speaker systems, (2), woodgrain, btfl, $500/pr; (2) Jensen bookshelf speaker, approx 12" x 20". $50. D Jackson, WQQQ, Wilton, CT. 203-762-9425.

Gemeni Sampler DS-24 like new, less than 1 yr old, $125. R Wesley, WKDO, POB 990, Liberty KY 42539. 606-787-7331.

dbx 2020 Computerized Spectrum Analyzer/EQ 10 memories. $800. 800-211-3999.

Want To Buy

Electro-Voice 15W or WK woofers, dead or alive; early 18" Jensen or Motiograph field-coil woofers; JBL LE-8's w/original Lansaloy surrounds; Older RCA field-coil compression drivers (grey bodies). B Rosenow, KTTS, POB 2180, Springfield MO 65801. 417-865-6614.

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LIMITERS

Want To Sell

Gates M-6467 FM Top Level, $50. B Preston, 503-947-3351.

GE BA-9-B Uni-Level amp (tube compressor), 6386, 6AL5, (2) 6V6, 5Y3-GT, gd cond, $150. R Franklin, Super Sound Studios, POB 1, Norristown PA 19404. 610-279-4515.

Orban Optimod 8000A, exc condition, manual incl, $1795. C Ellingtor, 334-867-4824.

Audiometrics ABO 560CD lazy susan wire CD rack, 6' high, holds 560 CDs, excellent condition, 27 1/2" radius, $300 plus freight. Larry, 717-523-1190.

Rotron Blowers for Elcom, Horris, CCA, CSI, McMartin, rebuilt & new. Goodrich Enterprises Inc. 11435 Manderson St Omaha, NE 68164 402 493 1886 FAX 402 493 6821

Collins IC 6 audio console: Zephyrus 304 mainframe satellite rcvr; Conex CG-25R 25Hz generator; 5 Otari ARS 1000 open reel machines. C Mandel, KWST, Box 1018, El Centro CA 92244. 619-352-2277.

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CBS Audiomax 4440A & Volumax 400, mod compressor/limiter & peak limiter, BO. D Nuechterlew, WFLT, 6130 S Dehmel Rd, Frankenmuth MI 48734. 517-652-6863.

Orban AM9100B Optimod, perfect cond, NRSC, manual, key, adj tool all included, $3000/BO. S Allen, WHNR, 1505 Dundee Rd, Winter Haven FL 33884. 941-299-1141.

Orban Optimod 8100A AXT2, never used. $750. Dave, KDEA, 318-267-7523.

Teletronics LA-2A vintage tube compressor, gd cond, $2500. Joe, JCF Labs, POB 184, Lincoln City OR 97367. 503-994-9023.

Want To Buy

Optimod 8100A, working or not. P Lopeman, 414-482-1959.

Teletronix LA-2A's, UREI LA-3A's & LA-4's, Fairchild 660's & 670's, any Pultec EQ's & any other old tube compressor/limiters, call after 3PM CST, 214-271-7625.

MICROPHONES

Want To Sell

Altec/WE 9-A mic swivel for 633A/B mics new, in original box, BO. R Franklin, Super Sound Studios, POB 1, Norristown PA 19404. 610-279-4515.

Lapel mikes, condensor/piezoelectret in pouch, 3 w/Canons out, 2 w/phone plugs, $65; Shure 571 dynamic lapel mike w/tie clip, long cord, Canon out, red velvet-type bag, $30; Shure 444T controlled magnetic desk mike, grey w/PTT bar & gain control grey, $25; Astatic T-UG8-D104, chrome finish, stand w/PTT bar, new in box. D Jackson, WQQQ, Wilton, CT. 203-762-9425.

RCA microphones, 44, 77 & BK-5, also RCA 90-A floor stand. W Davies. 818-761-9831.

Sony ECM-30, clean, in case w/clip & windscreen, $50 +S&H; Sony ECM-55B, clean, in case w/clip & windscreen, $100. G Hultman, Hultman Media Srvs, 300 Limpy Creek Rd, Grants Pass OR 97527. 503-474-6466.

EV PL20 (RE20) mics, gd cond, $325; RCA 77DX mics, re-cond w/new ribbons; Neumann KM84 pair. W Gunn, 619-320-0728.

Want To Buy

77-DX's, 44-BX's, WE KU-3A's On-Air lights, recording lights & audition lights. Top price paid. Fast response. Bill Bryant Mgmt, 2601 Hillsboro Rd, G12, Nashville TN 37212. 615-269-6131. FAX: 615-292-3434.

RCA 77-DX's & 44-BX's, any other RCA ribbon mics, on-air lights, call after 3PM CST, 214-271-7625.

MISCELLANEOUS

Want To Sell

Teac PB-64 RCA patch bay, $40. 800-211-3999.

SMC ESP-1 printed circuit cards for DS-20 switcher; also Mdl 452 Carousel. R Statham, WHLG, 1000 NW Alice Ave, Stuart FL 34994. 407-692-1000.

Bell/Radio Shack telephone bells for wall mount. D Bailey, Rock Shoppe Prod, 10027 Church Rd, Dallas TX 75738. 214-343-0879.

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Avcom SCPC 2000E receiver, $450; Voice cue card for Dart 384 receiver, $100; 15 KHz card for Dart 384 receiver, $100. B Preston, 503-947-3351.

Kenwood 150-170 MHz hand held radios, will set up on your RPU freq, $200. P Deen, WAJQ, POB F, Alma GA 31510. 912-632-1000.

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RECORDERS

Want To Sell

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Nakamichi BX-300 discrete 3 head pro cassette deck, perfect condition, $350 or B/O. Ray, 941-923-8239.

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Ampex AG440-2 2 track rackmount, good condition, $400. B Lindahl, Lindahl Studios, 10680 SW Wedgewood, Port-land OR 97225. 503-644-9643.

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Otari ARS 1000 2 chnl PB R-R, $400; Otari MX 5050 BQII 4 chnl R/P R-R, excel cond, $2500. J Travis, WCIK, POB 506, Bath NY 14810. 607-776-4151.

Teac Tascam 80-8, 8 channel, 1/2" tape reel to reel, $1300; (2) Ampex 1091 stereo, $50 ea; Wollensak 2770 cassette duplicator (stereo unidirectional), $250; Pentagon 1100 series, 4 channel cassette duplicator, $350; Sony TC-142 portable cassette deck, $130; Sony TC-152D 2-speed stereo cassette deck, $130; Wollensak 2851 cassette recorder/playback, heavy duty, B/O; Realistic high power video/audio bulker 44-133, new, $25; (2) Dukane 28A18 recorder/pulser, 50 Hz @ 0.45/2/0 sec, B/O. D Jackson, WQQQ, Wilton, CT. 203-762-9425.

Ampex AG440 1/2 trk mastering machines (2), one dbx NR unit & (2) 8 trk NR units. D Huettner, Dynamic Sound Studio, 358 W Bell St, Neenah WI 54956. 414-722-7228.

Otari ARS 1000 2 chnl PB R-R, $400; Otari MX 5050 BQ II, 4 chnl R/P R-R, 9 yrs old, excel cond, $2500. J Travis, WCIK, POB 506, Bath NY 14810. 607-776-4151.

Ampex 600's & PR10 for parts. BO. J Whatley, WNUZ, 110 Glenhaven Dr. Alexander City AL 35010. 205-234-2492.

Ampex ATR100 taperecorders for parts. Circuit cards, heads, motors, machine parts, or electronic parts. Call 818-907-5161.

Ampex AG-440-G R-R w/mono solid state repro/rec electronics, BO. D Nuechterlew, WFLT, 6130 S Dehmel Rd, Frankenmuth MI 48734. 517-652-6863.

Ampex MM1000 16 track, with emote control & set of 8 track head stacks, $4000/BO. D Huettner, Dynamic Sound Studio, 358 W Bell St, Neenah WI 54956. 414-722-7228.

Sony/MCI 24 trk w/AL III, never lapped, w/manual, $10,500. R Leonard, Voices, 212-935-9820.

Revox PR-99 MK2 2 track with autolocator in mint condition, $1000. W Whitney, Whitney Creative, 2232 Wengler, Overland MO 63114. 314-428-8430.

Tascam MS-16 1" 16 track with autolocator, mint condition, low hours, alignment tape, dbx NR, $4500. Mike, Trinity Recording, POB 2479, Flagler Beach FL 32136. 904-439-3671.

Tascam 34B 4 trk w/8x8 Tascam audio board, gd cond, $1200. Dave, KDEA, 318-267-7523.

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Want To Buy

Ampex, Roberts, Magnecord tube type reels, books & parts a plus. HD Norman, NDXE Corp, 747 Wire Rd, Auburn AL 36830. 334-826-0390.

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REMOTE & MICROWAVE EQUIPMENT

Want To Sell

Gentner G2500 super hybrid, built in mix minus, digital hybrid, $1300; Gentner SPH-3 (2) telephone hybrids, like new, $350 ea. J Travis, WCIK, POB 506, Bath NY 14810. 607-776-4151.

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Epsom color radar, $500; Com Dial 8 station phone system, $50. G Quinn, WMRS, 132 N Main St, Monticello IN 47960. 219-583-8933 or 513-399-7250.

Sine Systems with dial out & voice card, $1000. M Rollings, 314-968-4212.

TELOS 100 digital hybrid telephone interface, $475.00. **Panasonic WV-450** audio mixer, unused, $275.00. D Harris, 703-319-1431.

Gentner G2500 1 yr old, super hybrid, built in mix minus, digital hybrid, $1300; Gentner SPH-3 (2) telephone hybrids, one blk & one beige, like new, $350 ea. J Travis, WCIK, POB 506, Bath NY 14810. 607-776-4151.

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Moseley 505 transmitter and Marti STL-8 receiver, $1050. D Jackson, WQQQ, Wilton, CT. 203-762-9425.

CCS Micro 56+; Comrex STLX, send & receive units, prices available on request. Jack, 813-556-2527.

Want To Buy

Marti RPU receiver & transmitter, working or not, reasonble price. P Deen, WAJQ, POB F, Alma GA 31510. 912-632-1000.

Marti system VHF or UHF, working or not. P Lopeman, 414-482-1959.

SCA generator & demod, 110 kHz for STL, Marti SCG10/SCD10, Moseley SCG8/SCD8 or equivalent. J Sullivan, WKJR, 800-566-4811.

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Scientific Atlantic AD-7550, $1000; Micro Phase MP2030S, $400. M Rollings, 314-968-4212.

Offsat/Comtech parabolic antenna, 18', transportable, C-band, mint condition. Tony, 305-888-4883.

Adcom 7010 FM demod SCPC cards, Best Offer; Colorado Magnetics Satcue 400 with ribbon cable & manual, Best Offer. T Gayne, KTMC, POB 848, McAlester 74502. 918-423-1400.

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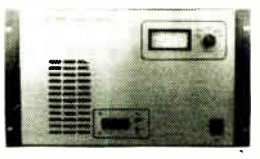

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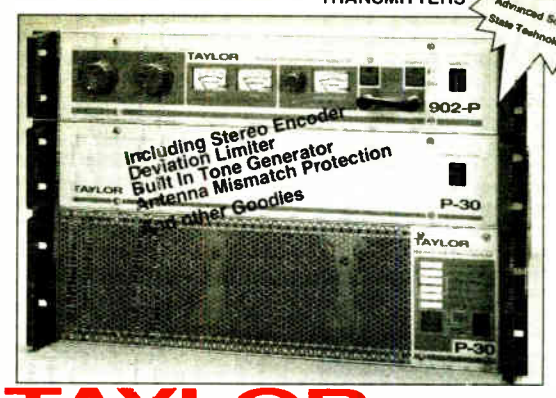

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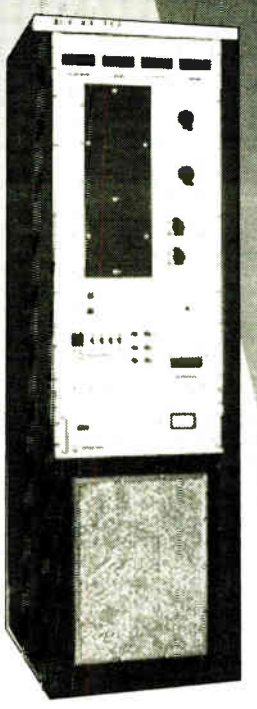

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Accounts Receivable ..... Steve Berto

Advertising Sales Representatives
U.S.East: Skip Tash ..... 703-998-7600 Fax: 703-998-2966
U.S. West: Dale Tucker ..... 916-721-3410 Fax: 916-729-0810
International: Stevan B. Dana ..... +1-703-998-7600 Fax: +1-703-998-2966
Europe: Dario Calabrese ..... +39-2-7030-0310 Fax: +39-2-7030-0211
Japan: Eiji Yoshikawa ..... +81-3-3327-2688 Fax: +81-3-3327-3010

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