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 See pages 19-29.**

Vol 20, No 18

Radio's Best Read Newspaper

September 4, 1996

Mixed Reviews for RFR Ruling

by Lynn Meadows

WASHINGTON The Radiofrequency Report and Order recently released by the Federal Communications Commission is a hit and a miss for broadcasters.

The good news is the FCC will not require stations to measure induced or contact currents — yet. The bad news is that the commission did not extend the preemption clause to broadcasters.

The ugly news is for the few broadcasters who have had suburban creep too close to their fence line: Effective Jan. 1, 1997, the RF limits for the general population will be five times stricter than those for fully informed employees.

Lukewarm reception

Kelly Williams, director of engineering for the National Association of Broadcasters, said he was "cautiously optimistic" about the new rule.

The NAB and other industries had urged the FCC to use the RF standard released by the IEEE in 1991 and subsequently adopted by ANSI in 1992 (C95.1-1992).

The FCC, however, pressured by the Environmental Protection Agency, chose to adopt field strength and power density limits established by the National Council

of Radiation Protection (NCRP) in 1986.

John Osepchuk, chairman of the committee reviewing the 1991 IEEE standard, criticized the FCC for ignoring the thousand of man hours that went into C95.1-1992 and the broad scientific consensus it represented. He predicted the FCC would eventually return from the current "mish-mash" to the IEEE standard.

"We're generally pleased with the structure they adopted," Williams said, adding that the deferral of action on induced and contact currents was good news.

When the FCC originally proposed that FM stations below 100 MHz be evaluated for exposure from induced and contact currents, commenters responded that the measurement equipment is expensive and often unavailable or unreliable.

While it did not adopt limits for induced or contact currents, the FCC noted that limits were desirable and might be adopted "particularly if more accurate measuring instruments become available."

The NAB asked the FCC several times to preempt local and state regulations surrounding RF radiation. In the new rule, the FCC preempted local RF radiation regulations for personal wireless service facilities but not for anyone else.

"That's going to be a very big issue for us in the next 10 years," said Williams

pointing out the double hurdle new ATV and possibly DAB facilities will face with regulations at both the local and federal levels.

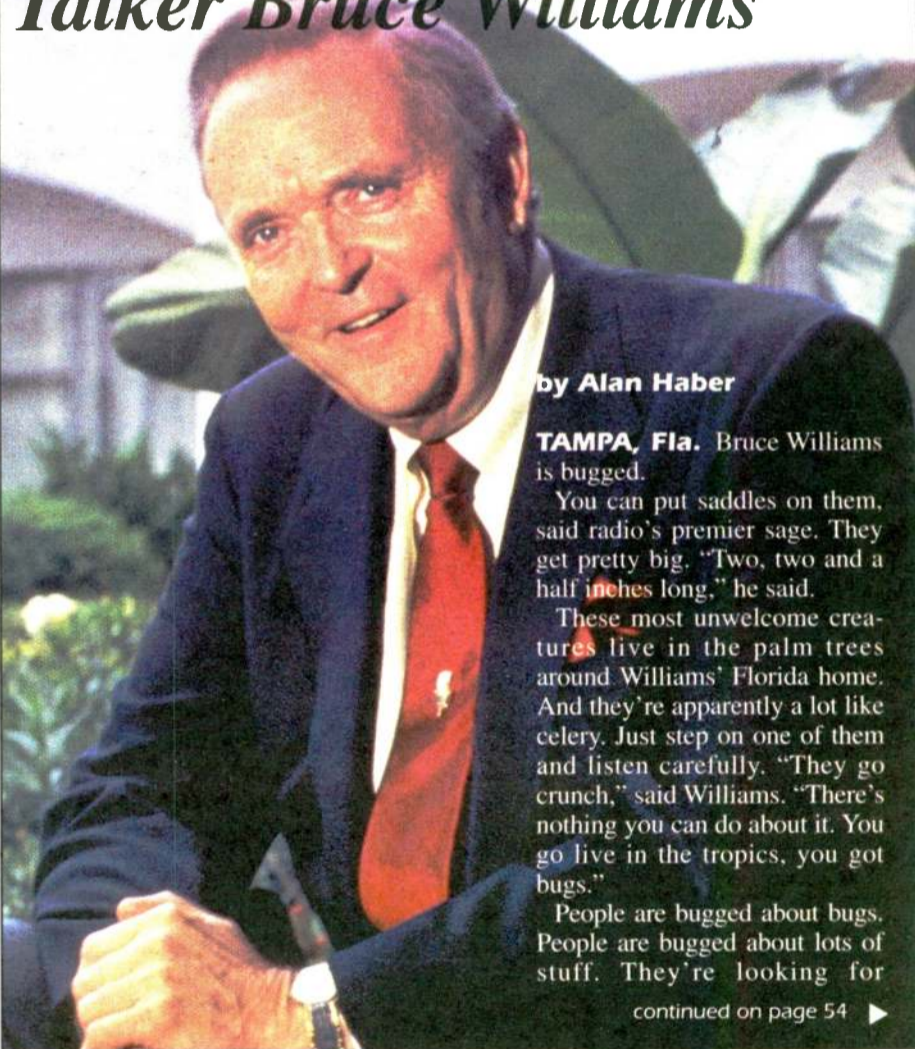
Richard Engelman, chief of the Standards Development Branch of the Office of Engineering and Technology,

said in order to preempt local RF regulations for broadcasters, the FCC needs "more evidence that there's a problem that needs to be fixed."

One of the clauses in the order may make localities rest a little easier, however. The FCC established RF levels five times stricter for "uncontrolled" environments where the general population would be.

Broadcasters will be relieved, however, continued on page 12 ▶

The Wonderful World of Talker Bruce Williams



by Alan Haber

TAMPA, Fla. Bruce Williams is bugged.


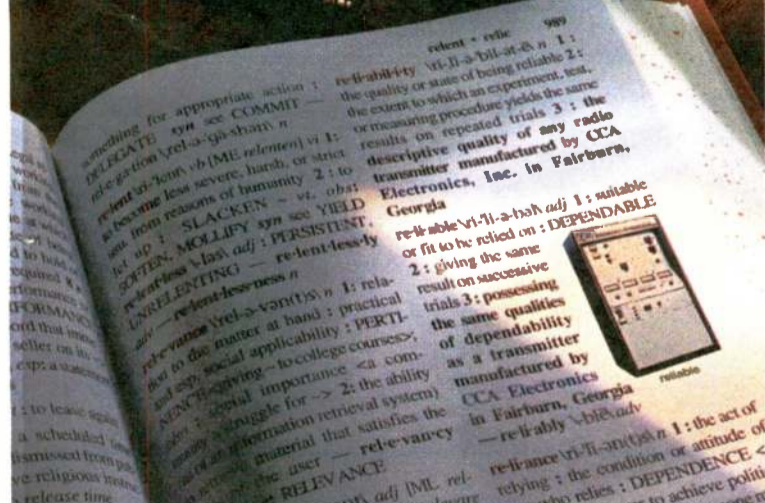
You can put saddles on them, said radio's premier sage. They get pretty big. "Two, two and a half inches long," he said.

These most unwelcome creatures live in the palm trees around Williams' Florida home. And they're apparently a lot like celery. Just step on one of them and listen carefully. "They go crunch," said Williams. "There's nothing you can do about it. You go live in the tropics, you got bugs."

People are bugged about bugs. People are bugged about lots of stuff. They're looking for

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WASHINGTON You can learn a lot about Robert D. Greenberg by visiting his office. Start with the "I Love Radio" buttons that accessorize his desk. Check out the posters of sandy beaches, palm trees and waterskiing on the back of his office door.

But most of all, there are the piles. Neat and orderly, they consume his desk. And every pile represents an issue that will

have a major impact on broadcasters.

Greenberg is a senior supervisory engineer for the Audio Services Division of the Federal Communications Commission. The stacks on his desk represent only a sampling of the number of issues he is involved with.

He gives a tour.

"This is the rulemaking to permit cer- continued on page 30 ▶

NEWSWATCH

American Radio Systems to Merge with EZ

FAIRFAX, Va. American Radio Systems and EZ Communications announced last month that they have entered a merger agreement.

EZ shareholders will receive 0.9 shares of ARS Class A Common Stock and \$11.75 in cash per share of EZ. ARS will have to issue approximately 8.7 million shares for EZ's 9.6 million fully-diluted shares outstanding.

ARS is currently a 25-percent shareholder in the Radio Data Group that is active in High Speed Subcarrier testing. Once the purchase is complete, it will

own a 50-percent interest in RDG.

BIA Consulting reports that ARS will own, operate or sell advertising for a total of 97 stations in 21 Arbitron rated markets once the transaction is complete in early 1997. BIA reported that total station revenues for the two groups combined were estimated to be about \$333 million.

EZ Chairman Art Kellar and EZ President and CEO Allan Box control 74.9 percent of EZ voting power and will become members of the ARS board of directors.

EAS Training in Baltimore

BALTIMORE An EAS training seminar for all Maryland and Washington-

area broadcasters, radio, TV and cable, is scheduled for Wednesday, Sept. 11, at the Hilton Inn - Pikesville.

Acting EAS Chief Frank Lucia and other FCC members will be in attendance along with representatives from the Maryland Emergency Management Agency, the National Weather Service and FEMA.

The seminar will last from 8:30 a.m. - 1 p.m. Participants are invited to a continental breakfast beforehand which starts at 7:30 a.m.

At the conclusion of the training seminar, vendors of type-approved EAS equipment will offer hands-on demonstrations of their respective equipment.

For more information, contact M.H.

Blum, chairman of the Maryland State Emergency Communications Committee, at (410) 269-0700.

Clinton Nominates New Commissioner

WASHINGTON President Clinton nominated Regina Keeney to replace former FCC Commissioner Andrew Barrett.

According to Chairman Reed Hundt, Keeney is the first career employee in the history of the FCC to be nominated for one of the five FCC commissioner seats. Keeney has served as chief of both the Wireless and Common Carrier Bureaus.

Prior to joining the FCC, Keeney, a lawyer by trade, served as Republican Counsel to the Senate Commerce Committee. The other four commissioners heartily praised the nomination as did the National Association of Broadcasters.

Said Commissioner Susan Ness, "Her greatest achievement is also her most recent: orchestrating the Herculean effort

continued on page 3 ▶

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NEWSWATCH

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to develop rules for competition in local telephone markets."

Central New York Convention

SYRACUSE, N.Y. The 24th Regional Broadcaster's Convention, hosted by Chapter 22 of the Society of Broadcast Engineers, will take place in Syracuse on Sept. 20.

The chapter promises the latest in broadcast, communications and production technologies plus equipment displays, technical papers and manufacturers' representatives on hand to answer questions.

The convention will last from 9 a.m.-5 p.m. and will be held at the Sheraton Inn Convention Center in Liverpool, N.Y. The SBE has awarded the convention with the "Best Regional Convention Award" several times.

Contact Convention Chairman John Soergel at (315) 437-5805 for more information.

RAB RadioTalk Debut

DALLAS The Radio Advertising Bureau recently added three discussion groups to its Radio Link marketing resource system on the Internet.

The RadioTalk groups will allow radio marketing professionals nationwide and around the globe to share their thoughts, problems, ideas, questions, answers and solutions on a wide range of radio issues.

RadioLink subscribers may privately view the contributions of other users or publicly participate in bulletin-board style discussion groups.

The three initial discussion groups are Small Market Discussion, Sales Training Discussion and General Discussion. RadioLink is available only to RAB members. To subscribe, call (800) 232-3131.

NPR Approves Discount Membership

WASHINGTON The National Public Radio Board of Directors approved major revenue and distribution initiatives and a new membership discount policy for rural stations in its summer meeting.

The board endorsed NPR's strategic business approach and directed the organization to move forward to develop new revenue and audience growth opportunities.

Meeting the Challenge of Digital Change

LOS ANGELES The National Association of Broadcasters Radio Show will include two technical seminars (one on engineering management and the other on digital radio).

Seven sessions will comprise the Digital Radio Seminar being held Oct. 10: The Engineering Management Seminar on Oct. 11 will focus on the principles of attracting and retaining exemplary employees. ☐

AM, PCS Agree to Share Tower

by D.C. Culbertson

EVANSTON, Ill. As the number of Personal Communication Services (PCS) continues to increase across the country, a corresponding problem is increasing as well: the possibility of PCS interference to pre-existing AM stations.

There are few provisions on the books to protect AM stations from this possibility (RW, July 24). That is probably because no one could have imagined the rapid growth in the personal communications industry in such a short time.

A pre-existing rule which prevents Part 22 licensees like cellular and paging companies from distorting AM patterns does not apply to PCS licensees with Part 24 licenses. Further, the FCC presently has no rule which would protect an AM pattern from a PCS tower.

However, as the case of Spanish-language WONX(AM) in Evanston clearly shows, an AM station and a PCS company can reach an agreement that will ultimately benefit both.

Same site

It all started when telecommunications company Primeco wanted to put up a transmitter on the same site as the WONX tower.

Rather than fighting over it, Ken Kovis of WONX, Primeco engineer Dana Holland and Ted Shober, who has been an engineering consultant for WONX for a number of years, put their heads together and came up with a mutually beneficial situation.

All concerned decided that the best possible solution was to replace the old tower with a folded unipole design manufactured by Nott Lt., a company in New Mexico specializing in detuning equipment.

Originally intended to serve as a way to consolidate AM and FM transmitter facilities with the help of detuning skirts, this type of antenna allows for a grounded tower without the need of expensive isolators.

It has the added advantage of enhancing sound, preventing lightning damage and working well regardless of available ground systems.

Rent a spot

In addition, because the design allows a station to rent its transmitter facilities to telecommunications companies, it could also generate additional revenue.

Because the WONX tower was old and its ability to withstand the additional loading was doubtful, Primeco offered to replace the tower if it was allowed to add an auxiliary antenna to cover its transmissions.

However, certain special factors unique to PCS companies had to be taken into effect when designing the new tower.

Traditionally, when an AM tower is built, insulators are put at the bottom of the tower. Because this poses a problem for PCS people, the engineers designed a tower with no insulators and the PCS antenna at the top of the tower.

According to Shober, there were other special considerations. For instance, while waveguides are usually attached to the top of a tower, here they had to be bonded every 60 feet so the AM signal would not get bonded.

The ground system had to be rebuilt to accommodate the different requirements of the PCS system. Because any power over 400 W could create hazardous work conditions, there had to be a way of decreasing the power to allow workers from Primeco to climb on it while

WONX was on the air. Fortunately, because the PCS antenna is an auxiliary, this was not a major consideration.

Shober expected the new tower to be up and running by September. If successful, it could prove a solution in similar situations around the country. ☐

Orban Acquires DDS From Radio Systems

by Alan R. Peterson

BRIDGEPORT, N.J. Orban has acquired product and development rights to the Radio Systems DDS Digital Delivery System audio storage and playback product line. Terms of the sale were not disclosed.

The official announcement of the Aug. 9 sale was made in a press release by Orban, a Harman International company. Orban President Derek Pilkington stated, "With this asset acquisition, Orban is building a strong base for our future growth."

"There is an emergence of major players in the digital delivery arena," said Dan Braverman, president of Radio Systems. "Only a few digital systems will

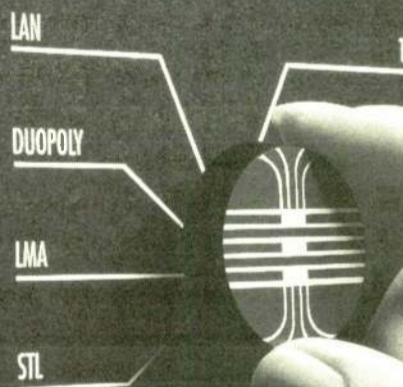
emerge as standards, and DDS deserves to be one of them. Orban has the strength to make sure that happens.

"Small, agile companies like Radio Systems are perfect to innovate and 'event' a product," said Braverman. "Larger groups like Harman are best poised to take the product forward, especially abroad because of their excellent international presence."

The Radio Systems DDS took on the nickname "fish-finder" due to the appearance of the cart head operator interface: a small, durable metal box with a backlit data screen and a series of rubberized buttons designed to emulate the functions of a cart machine.

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Keep an Eye on Interactive Media Growth

All Segments of the Electronic Communications Age Projected to Outpace GDP Growth by the Year 2000

WASHINGTON The soothsayers have dusted off their crystal balls, with predictions for the health of the world of communications ringing fairly positively in the air.

One of the better-known forecasts is from the New York-based investment firm of Veronis, Suhler & Associates. In its 10th Annual Communications Industry Forecast, revenue growth for the communications industry is forecast at 7 percent for the 1995-2000 time period.

The 7 percent growth is predicated on a favorable economic outlook, improved advertising spending across all segments, increased consumer spending on emerging media and a pickup in expenditures on business information.

By leaps and bounds

Of the 10 industry segments covered by the Veronis Suhler forecast, interactive digital media will post the largest five-year compound annual growth with a 19.4 percent gain, followed by subscription video services and recorded music.

I think the interactive digital media segment deserves a closer look as it can be either a marketing partner or a direct competitor to a radio station.

—Although I will admit that, once again, I spent some time on the Internet today trying to find web sites for local television stations in the hopes of finding out if my favorite Redskins quarterback, Gus Frerotte had been named starting QB for the team. And once again, I had to turn to radio, WTEM at 570 kHz, to discover, almost immediately, that the fans' choice, Gus, had indeed been chosen.)

Boosted by expanding computer penetration in the household, the emergence of on-line services and the use of the

Internet by consumers, spending on interactive digital media as a category will rise to an estimated \$20.3 billion by the year 2000 — from \$7.6 billion in 1995. This translates into a 21.6 percent rate of growth compounded annually, the fastest rate of growth of any communications category covered by the forecast.

Household spending for on-line and Internet-access services are predicted to triple during the five-year forecast period, rising to \$10.9 billion by the year 2000, from \$3.2 billion in 1995 — a 28.2 percent compound annual growth rate.

Spending on packaged PC/multimedia



Radio listening at home dropped nearly 35 percent between 1981 and 1995. By contrast, listening in automobiles rose nearly 59 percent.

software, including general interest titles, educational software and computer game and entertainment software, will increase from an estimated \$1.4 billion in 1995 to \$3 billion in the year 2000.

The most mature interactive digital media category, video-game console software spending is predicted to total \$4.3 billion in 2000, up from \$3 billion in 1995.

Interestingly enough, Veronis Suhler forecasts that in the 1995-2000 time period, television, recorded music, consumer books, home video and interactive digital media — principally on-line services, the Internet and video games — will take up more of consumers' time. By the year 2000, the forecast predicts that the num-

ber of hours per year devoted to overall media usage by the average consumer will rise to 3,540 from 3,401 in 1995.

Radio's outlook

Veronis Suhler outlines a fairly positive outlook for radio for the 1995-2000 time span. The forecast believes that spurred by deregulation, radio broadcasting will continue to consolidate, enabling stations to sell advertising more efficiently.

Bottom line: total radio advertising will increase to \$15.9 billion in 2000 from \$11.3 billion in 1995, a 7 percent compound annual rate, and, radio's share of measured media advertising will expand to 11.5 percent from 11.3 percent (somehow I wish we could jack that number up to more closely match media consumption, don't you?).

The breakdown for local and national advertising is as follows: local radio advertising will increase at a 7.4 compound annual rate during the 1995-2000 period, reaching \$12.6 billion, and national advertising will post a healthy 6.5 percent compound annual rate. Radio

Nationwide, 2,582 stations or 27.3 percent program Country. Adult contemporary held on to second place with 1,414 stations — a drop of 500 stations since 1990. The news/talk format has been the biggest net gainer during the last five years, gaining 731 stations to rank third with 1,132 stations in 1995.

Another big gainer was the religious format, picking up 179 stations and golden oldies ranked fifth with an additional 71 stations picking up the format since 1990.

And for those who complain that there isn't enough diversity of programming on our airwaves — you are right. Seventy-one percent of all radio stations program the top five formats.

Audience

And who is listening? Veronis Suhler reports that the aggregate radio audience, after rising by 2.9 percent in 1994, held stable in 1995 (with a minute 0.1 percent decline). The audience for AM stations rose 3.2 percent in 1995, its first increase since 1991.

The long-term shift away from AM toward FM continues, however, with FM garnering 78.9 percent of listening last year.

Another interesting little factoid: radio listening at home dropped nearly 35 percent between 1981 and 1995. By contrast, listening in automobiles rose nearly 59 percent in the same time period.

Wise words

The explosion of growth predicted for interactive media is phenomenal — there is no doubt about it. But radio broadcasting is expected to hold its own in a more than respectable fashion. When we finally get our digital broadcasting system selected — be it in-band or new band — who knows how strong radio can continue to be well into the next century.

It's a little like Gus Frerotte and Heath Shuler. While Heath may be the one with the millions and the "golden boy" image, Gus has quietly delivered in game after game for the team with no fanfare and no excuses.

He is a little like radio — undervalued, underpaid but still No. 1 in the hearts of the audience.

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GUEST COMMENTARY

Glory Days of WHA Came Long after Its Debut

by Kent Waterman

SAN FRANCISCO Barry Mishkind's excellent Pioneer Profile of "The Oldest Station in the Nation," 9XM-WHA, Madison, Wis., (RW, July 10) told the story of the early station, but didn't delve into its most influential years. They were the late glory days of radio, centered in the decade of the 1950s, just 40 years ago.

I was fortunate to be a student staff engineer, later announcer, at WHA from 1955 until 1958. Through its eight repeat FM and two AM transmitters, the WHA signal covered virtually all of the 4 million inhabitants of Wisconsin.

From Radio Hall (a converted steam plant) on the Madison campus of the University of Wisconsin, WHA became

more than just claimant to "The Oldest Station in the Nation." The Wisconsin State Broadcasting Service was then the dominant cultural force in Wisconsin.

The upper Midwest from Minneapolis to Chicago was an especially well-served radio community.

From the 50-gallon CBS Minneapolis outlet, WCCO, to the behemoths WGN, WBBM and WLS in Chicago, AM radio was the king of entertainment. Still, for culture in the '40s and '50s, one listened either to the FM signal of KUOM from the University of Minnesota campus or to any of the 10 Wisconsin State Broadcast Service stations carrying WHA broadcasts. (WFMT, the excellent cultural powerhouse in Chicago, was yet to come.)

Influential citizen

What WHA and the W.S.B.S. carried for 18 hours a day was a good mix of news, tips for homemakers, children's programming, serialized books and, especially, music.

Depending on time of day, that music ranged from easy listening to live studio pipe organ to considerable recorded classical music. These were among the final days before much more strictly formatted stations.

Under the direction of H. B. McCarty, state-funded WHA had influence. Second-in-command Bill Harley would later head the National Association of Educational Broadcasters. Ray Greiner, manning the transmitters in the basement at WHA, would write extensively on recorded and broadcast sound. Music Director Don Voegli influenced a generation of technicians in proper recording of the Studio A pipe organ (and fathered the man who would develop "St. Paul Sunday Morning" for National Public Radio).

Chief Announcer Ken Ohst and Bob Homme were seen nationally via kinescope in the children's program "The Friendly Giant" from WHA-TV. Carl Schmidt was heard for decades doing "Chapter A Day."

Many hours of the broadcast schedule were devoted to courses from U.W. classrooms and heard tuition-free throughout the state. Wisconsin was part of the politics of the day. It had elected Joe McCarthy to the U.S. Senate and was, in many minds, beholden to his heritage. WHA was a strong news station, probably liberal in intention, but vehemently non-partisan in presentation.

In news, the aftermath of Joe McCarthy caused my most embarrassing moment. It came at the hands of Eleanor Roosevelt, former first lady and by then the U.S. Ambassador to the United Nations. I was the engineer for a remote interview of Mrs. Roosevelt from the Student Union on campus. Unfortunately, when she entered the room, I failed to stand. Thinking it was perhaps an intentional

Mixed RFR Ruling

The Federal Communications Commission ended years of struggling with the adoption of a new Radiofrequency Radiation standard when it released its Report and Order on the same recently. Never mind that it literally took the Telecommunications Act of 1996 and a six-month deadline for the FCC to get the new RFR rule out.

Good news and bad. Back in April, RW urged the FCC to follow the advice of the National Association of Broadcasters and to base its ruling on the ANSI/IEEE (C95.1-1992) standard.

The FCC, however, pressured primarily by the Environmental Protection Agency, chose to adopt field strength and power density limits established by the National Council of Radiation Protection (NCRP) in 1986.

What this means for the United States as a whole is that we are divided on our RFR standards with the Department of Defense, OSHA, NATO and others using the ANSI/IEEE version and the FCC and EPA supporting the NCRP version.

The NAB based its push for the ANSI/IEEE standard on solid arguments: the ANSI/IEEE standard was more current; the ANSI committee was comprised of 120 members vs. six for NCRP; ANSI meets every six months while a new NCRP committee will take three to five years to revise the standard and then dismantle itself; and the ANSI standard is generally more protective.

The refusal of the FCC to preempt local and state regulations surrounding RF radiation is another sore point for the industry. The NAB asked the FCC several times to preempt local and state regulations surrounding RF radiation. In the new rule, the FCC preempted local RF radiation regulations for personal wireless service facilities but not for anyone else.

Understandably, that will become a big issue for broadcasters in the next 10 years (what with ATV and possibly DAB facilities).

Broadcasters should note, however, the "transient passage" section of the report. It states that the higher levels also will apply "where exposure is of a transient nature as a result of incidental passage through a location where exposure levels may be above general population/uncontrolled limits, as long as the exposed person has been made fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area."

Broadcasters will have to wait for the explanatory bulletin due out in November to see precisely what is entailed to make those people passing through "fully aware".

The industry waited a long time for the commission to rule on RFR. Too bad the news was so mixed. Perhaps the broadcasters will keep on this regulatory issue and encourage the FCC to revisit and revise it frequently. NAB should do the same.

— RW

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slight, she immediately, witheringly upbraided me. The mic was live and whatever audience we had that afternoon heard her thoroughly chew out an ignorant farm kid. (The memory of that embarrassing incident was in my mind when, two years later, I chose to decline the H.V. Kaltenborn news scholarship at Wisconsin ... that and recollections of his virulently anti-FDR newscasts of the '40s.)

But music, both live and recorded, was the main force behind the WHA network. I recall many a cold winter evening hauling a Magnecord M-90 and Telefunken 47 to a local church to record organ recitals by the personable Gertrude Stillman.

With an early, staggered-head stereo "Maggie," I captured a rare live concert of Toscanini's protégé Guido Cantelli conducting the touring New York Philharmonic on campus.

Through its many live and recorded concerts, WHA was establishing a serious interest in better broadcast sound. AM/FM stereo simulcasts in 1956 were among the first in the nation. Later, WHA would serve as a focal point for the Society of Broadcast Engineers in the region and host annual broadcast conferences of some influence.

Ten years ago, I returned to Madison for a visit. WHA was no longer the "call"; indeed the very broadcast format was heavily NPR, not local. Now housed in larger facilities across campus, the successor to WHA sounded much like any other NPR station.

It had become more an adjunct to television — albeit public television — than an independent, important regional cultural voice.

Radio Hall itself was given over to administration, its Langevin master control board silenced, its RCA turntables and Studio A pipe organ gathering dust.

What had overtaken "The Oldest Station in the Nation" was, at least to my ears, nothing less than the diminishment of the influence of radio since the mid-'50s. The needs of NPR over any local or regional imperative simply meant the demise of all-segment broadcasting with which WHA had excelled.

Still, what those early 9XM physics students wrought in constructing their own triodes before the First War and what some were doing at WHA after the Second were the very source and soul of radio.

The '50s were the late golden years at the nation's oldest station, "Twixt" WCCO Minneapolis and WGN, WBBM, and WLS in Chicago, we had something going. Whether 4 million people always recognized it is another question.

□ □ □

Kent Waterman is a retiree from KGO-TV, San Francisco, and was on the air in the '60s and '70s at Bay Area Music Stations, KSFR, KBRG, KRE/KPAT/KDFC and KKHL.

Correction

On page 45 of the May 29 issue of RW, we incorrectly identified the BC-2000 and BC-500 mixing consoles and the PME-02, TLE-02 and MP-10 portable mixers as being shown by AEV. They are products from the Spanish company, AEQ.

First Taste of Night Air for WLIB

by Lee Harris

NEW YORK WLIB(AM), the New York Station that will be upgrading at the expense of 50 kW WOWO(AM) in Fort Wayne, Ind., is still months away from having full-time operation.

Earlier this summer, however, the Federal Communications Commission granted the daytime-only station special nighttime operating authority to cover the Republican and Democratic National Conventions, as well as the local Brooklyn Labor Day Carnival.

While the 10 kW WLIB has gone to great lengths and expense to secure eventual nighttime operation on its frequency of 1190 kHz, the necessary engineering changes have yet to be accomplished.

Major media force

WLIB has been a daytimer since it signed on in 1942. Despite that limitation, it has grown into a major media force in the New York African-American community.

In recent years, the station improved its position by developing a talk format targeted at the community. The programming has been controversial at times, especially during such racially charged episodes as the 1991 Crown Heights riots in Brooklyn.

WLIB set off another controversy with its elaborate plan to go full time. In 1994, Inner City Broadcasting, owners of

WLIB, bought the legendary WOWO, the station WLIB protects by signing off at night.

The plan was to reduce WOWO from its 50 kW giant status to 50 kW days/9.8 kW nights, clearing the way for WLIB to go full time by adding 30 kW nights to its current daytime power of 10 kW.

Once the paperwork for the power reduction was approved, Inner City re-sold WOWO, to Pathfinder Communications, operators of three other stations in Fort Wayne.

From the legal and logic standpoints, the arguments in favor of the move were sound. Inner City maintained that WOWO could continue to serve the Fort Wayne metro with its reduced nighttime power, while making it possible for millions of potential listeners in New York to get full-time service from WLIB.

There were numerous objections, especially from radio purists who saw this as a further desecration of the once sacred doctrine of clear-channels.

Nevertheless, Inner City prevailed and now it's a matter of making the necessary engineering changes. The WLIB upgrade project is untold months away from completion, and WOWO transmitter engineer Jack Didier said that his station has not made any of the necessary changes to fulfill the construction permit for the power reduction.

Didier said management has yet to decide on a final construction plan. Prior

to the conventions, Didier said he was unaware of the WLIB temporary nighttime authorization. Such authorizations are usually granted only in emergencies.

But WLIB talk programming director Mark Riley said that the Inner City Broadcasting FCC counsel apparently had no trouble getting the special authorization, apparently on the strength of the WLIB approved construction permit for full-time status.

Unique presentation

Unlike similar authorizations, Riley said WLIB would be allowed to broadcast commercials during its extended hours. Riley has been covering the national conventions for WLIB since 1976, but this was the first time he was able to go live during the prime evening hours.

While extensive convention coverage is widely available on radio, Riley said the WLIB presentation is unique.

"We have a very specific audience (predominantly African-Americans) who look for a different type of coverage. People want to know specifically what efforts are being made by both parties to speak to the African-American community and we become their conduit in that regard."

While the current climate would probably find WLIB more at home with the Democrats, Riley insisted that the station's approach to its political coverage is balanced.

"We are not highly represented in the (Republican) party, but there are a lot of people in our audience who have expressed curiosity about what Black

Republicans are about and what the Republican party is about."

WLIB is also the primary station serving the burgeoning Caribbean population in New York, and that is why it requested special permission to cover the Labor Day Carnival in Brooklyn which is the event of the year for the Caribbean community.

Riley said WLIB has always covered the festivities, but up until now the station has had to call it a day just when the major concerts were about to begin.

"We won't broadcast the concerts live, but being on until 11 p.m. will enable us to talk to the artists, most of whose music we've played over the years, and to talk to the organizers."

The special authorization for WLIB expired Sept. 2, but Riley was hoping now that the precedent is set, the station will not have difficulty obtaining similar permission in the immediate future, while WLIB and WOWO work on making regular nighttime operation a reality.

"We have a presidential election in November, when ordinarily we go off the air at 5:30 p.m."

I would love to be able to stay on late on election night. I'm going to request of our legal people that we look into the possibility."

Until WLIB goes full time all the time, Riley said the station will use some other technologies to stay in touch with its audience during those long winter nights, most notably the WLIB web site at www.wlib.com

"The site will give people in the audience the opportunity to express opinions and stay in touch, even when we're not on the air. We hope they get in the habit of being able to communicate with us 24 hours a day."

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Radio Systems Sells Digital Delivery Line

► continued from page 3

The operating system is based on QNX, a realtime version of Unix, allowing multiple units within the system to work together and access the same information simultaneously.

"We have a fabulous product and customers are very happy with the sale to Orban," said Braverman. "The DDS has greater potential than a lot of the other products on the market today."

The sale does not imply that Orban is planning an integrated station-in-a-box approach by marketing the DDS exclusively with its popular DSE-7000 workstation.

The DSE now networks to the Enco DAD and Broadcast Electronics AudioVault on-air systems, and will eventually link to other systems as well.

"We expect to continue our DSE-7000 network links to competitive systems," stated Pilkington. "We want the customer to decide which products work best for their station."

Orban's Amy Huson said, "We're comfortable with that. We're not trying to do a single solution. It is an option, one I am sure we would love, but they are not joined at the hip."

Orban has no plans to alter the design of the DDS, especially the fish-finder operator interface.

"The current plans are to absolutely keep

the three interface surfaces they have," said Huson. "There is the computer, the fish-finder and the soundslate."

DDS manufacturing and product development has moved to the Orban San Leandro, Calif., facility. Broadcast veteran Rick Sawyer has joined Orban as the DDS product manager. Sales of the DDS will continue to be handled by Harris on an exclusive basis in the United States.

The sale of the DDS to Orban allows Radio Systems the twin luxuries of time

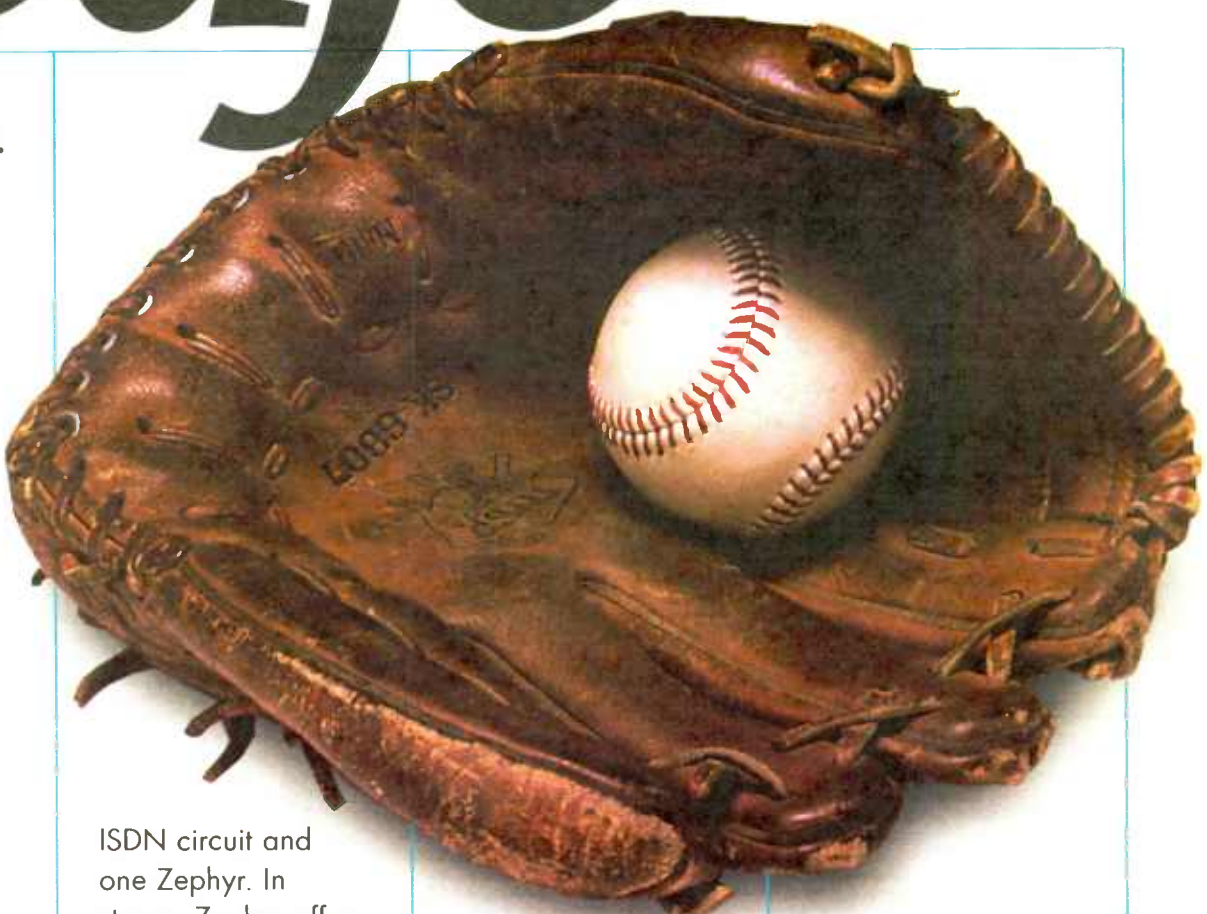


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and money to explore and develop other new products.

"This clears the deck for some very exciting opportunities," said Braverman. "Stay tuned."

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World Radio History

INTERNATIONAL UPDATE

DAB Allocation Begins in Canada

by James Careless

OTTAWA It's official: Canada has allocated digital radio frequencies in the L-band for existing AM and FM radio stations.

The Canadian Radio-television and Telecommunications Commission (CRTC) has also decided to license existing stations that simulcast on digital radio automatically.

Ready, set, go

Canadian broadcasters who want to establish Eureka-147 DAB stations can do so immediately.

The Digital Radio Broadcasting (DRB) Allotment Plan, released by Industry Canada in June, divides the 1452 and 1492 MHz frequency range into 23 1.5 MHz channels. Each channel is capable of carrying five stereo CD-quality audio services and ancillary data.

A "guard band" of 208 kHz is allocated between adjacent channels to prevent interference. The entire DAB L-band has 48 kHz guard bands at upper and lower ends of the spectrum.

The 23 channels are the eventual home of Canadian AM and FM broadcasters. The analog bands they currently use will ultimately be phased out of use. The

guiding principle behind the plan is to introduce DRB as a replacement service for AM and FM services rather than as a competitor.

Other DRB services may also be allowed someday, said Ralph Zeitoun, director of Broadcast Planning and Technical Policy for Industry Canada, "but our main purpose was to provide a digital position for every AM and FM station in the country."

The broadcast industry is applauding the government policy and with good reason: The plan mirrors radio industry recommendations, said David Garforth, executive director of Digital Radio

Research Inc., which is jointly funded by government and industry.

Reviewing the plan, Garforth said, "the main high point is it allows people to start planning for the implementation of digital radio with some spectrum allocation plans in place."

Not exact structure

Even though the DRB allotment plan does its best to shape the L-band as a replacement medium for AM and FM, the new spectrum is not structured exactly the same as the old bands.

Under Eureka-147 DAB technology, adopted as the Canadian standard, each channel carries five services. This means AM and FM stations will find themselves grouped together with their competitors, on centralized transmitter "pods."

And every station will migrate to the digital transmission system, even those serving the far-flung communities of the Canadian Arctic. In some cases this will mean fewer than five stations on a pod, but the architects of the plan intend for each of these stations to move to DRB locally and at their own speed.

Deciding who should be on which pod, and where, was a major concern of the architects of the plan. In the end, the emphasis was placed on cooperation, letting the broadcasters themselves decide which stations should be on which DRB transmitting pod.

"What you do (and this is happening now (is you get together with the other stations in your market and you look at the plan the department has put forward, and decide what you are going to apply for," said Wayne Stacey, technical advisor to the Canadian Association of Broadcasters and an influential player in the development of Canadian DRB.

Through the plan, the government has set up "a 'straw man' model that shows certain groupings that would fit with the plan," Stacey said. However, broadcasters do not have to go along with these suggestions.

"You can form your own groupings as long as you do not compromise the integrity of the plan," Stacey said.

What is most likely to govern who goes on which pod is transmission power. Because, contrary to popular belief, all DRB pods will not be created equal.

"It is a bit of a myth," said Stacey, "that each pod will have the same power and coverage. It does not mean that all channels in a market have the same coverage, because just as there are different classes of service for AM and FM now, there will be for DRB as well."

Limit the variance

Of course, the fact that five broadcasters will be grouped on a single pod will limit the variance between coverage powers. And stations at the very low end of the scale (such as CJOS(FM) in Karenport, Saskatchewan, a 5 W regional station operated by Briarcrest Bible College (will see their reach extended, simply because they will be grouped with higher-power mid-range broadcasters.

"Five-watt stations are a bit of an anomaly," said Stacey. "Obviously, if they get into a pod, you cannot constrain everybody else to the small coverage that they have."

Another aspect of the plan changes the existing order as well. Under the new rules, wide-coverage AM stations will have their reach curtailed to match that of the highest-power FM in the market.

continued on page 15 ►

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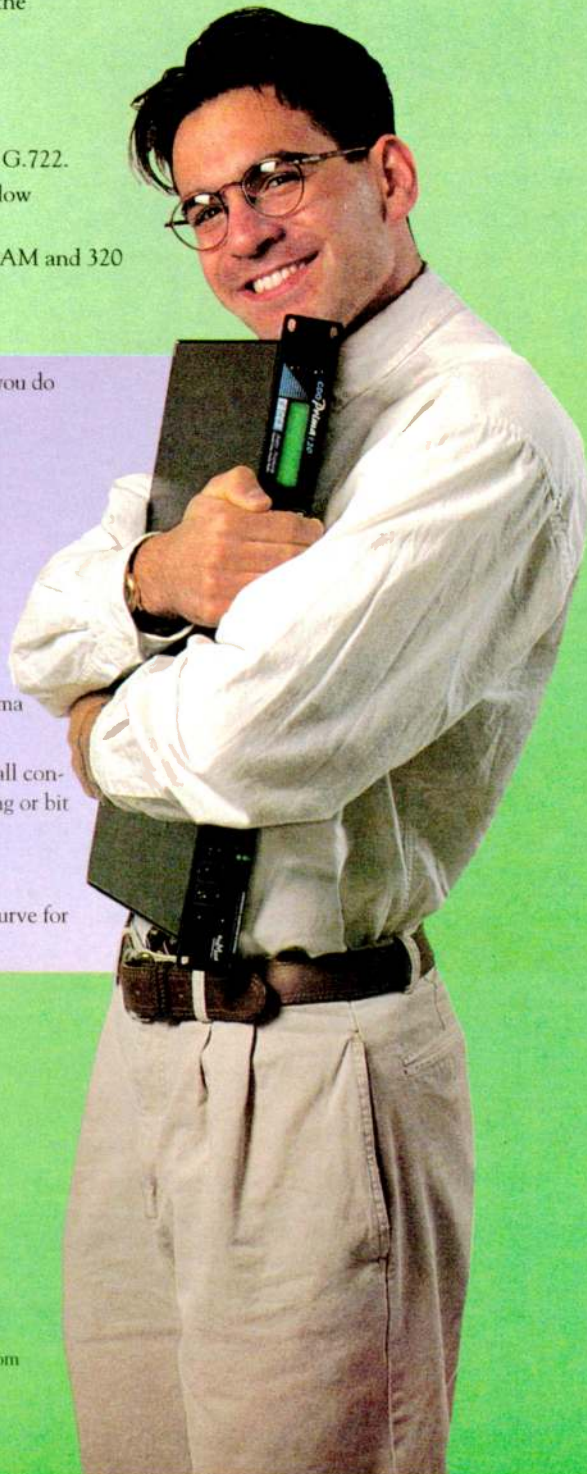
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World Radio History

Who Do You Call for EAS Planning?

WASHINGTON Maine and Vermont are still looking for Chairs to lead EAS planning at the state level. Any broadcaster in these states who would like to serve in this capacity, please contact Bonnie Gay at the Federal Communications Commission at (202) 418-1220.

The state committees are making decisions now that will affect every station. Some of the decisions being made that will affect individual stations are monitoring assignments, EAS designation and responsibilities, state relay infrastructure and monthly testing schedules.

Anyone who would like to offer his or her input to the decisions being made, use the following listing of the SECC Chairs by state:

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Dennis Bookey
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(907) 344-9622

ALABAMA:
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WNSP-FM
(334) 450-0100

Jack Hand
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ARIZONA:
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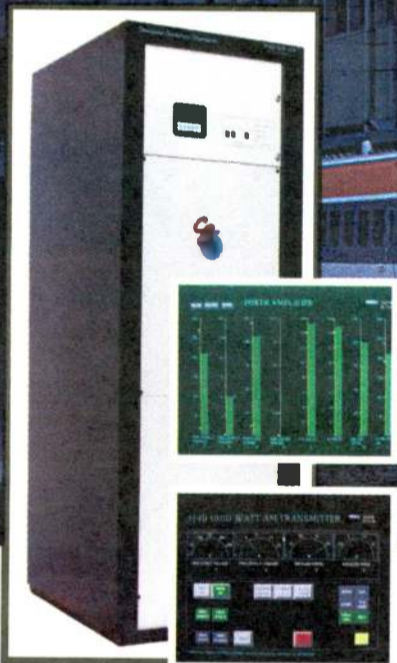
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Advertising Report Full of Facts

WASHINGTON Riding advertising's see-saw waves can make the powers-that-be at a radio station a bit seasick; it is best to always keep a lifesaver of some sort at hand.

Bereft of the Psychic Friends Network essence that could help them rise above constricting advertising roadblocks, business planners have to rely on local and national account possibilities and good old-fashioned business sense to keep their stations on the advertising straight and narrow.

Documents like the June 1996 McCann-Erickson's Insider's Report, written by Senior Vice President and Director of Forecasting Robert J. Coen, can help

planners and other station prognosticators see the all-important forest through the trees when assembling a business plan.

Facts at hand

When there is a need to look ahead and plan for any downturns in the economy and other factors that may cause the level of advertising to dip at a station, it is nice to have some facts on hand for reference purposes. The Insider's Report is chock full of such facts.

On the local front, the report reveals that advertising "is usually affected more by disruptions in the economy and weather than ad programs financed by national marketers."

According to the report, "local entrepreneurs immediately feel the effects from a slump in consumer confidence and a shutdown of government agencies.

Retail traffic and income stop immediately when a blizzard hits and resources for advertising quickly dry up."

National radio advertising appears to be healthy, although not equal to the levels experienced by the four television networks (ABC, CBS, FOX and NBC), cable TV networks, and syndication television.

The report does say that national advertising trends will get their greatest extra stimulation from the Olympics and the

elections in the second half of 1996.

According to the Insider's Report, national spot radio advertising was up only one percent in the first quarter of this year versus the same period last year; however, the Outlook for National Advertising - 1996 section of the report projects a six percent growth in spot and network radio advertising over 1995 to \$2.5 billion.

On the rise

On the local front, according to the report, spot radio is outpacing spot television. In a comparison of the first quarter of 1996 versus 1995, spot radio rose seven percent while spot TV took only a 5.2 percent bump upward.

Local radio comes up smelling like a rose in the report's Outlook for Total Advertising - 1996: An eight-percent increase to greater than \$9.6 billion is predicted in 1996 over 1995.

The same percentage increase is predicted for local television although the dollar amount is slightly higher at around \$10.7 billion.

Since factors affecting radio advertising in different-sized markets vary considerably, it is difficult to make blanket predictions that will apply on a general basis.

However, the Insider's Report predicts that after the modest growth in U.S. advertising in the opening months of 1996, "much stronger growth is indicated for the second half of this year."

How that will relate to specific local radio markets around the country is not known; nonetheless, it is positive food for thought.

—Alan Haber

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Circle (125) On Reader Service Card

World Radio History

New RFR Ruling

► continued from page 1

at the "transient passage" section of the report. It states that the higher levels also will apply "where exposure is of a transient nature as a result of incidental passage through a location where exposure levels may be above general population/uncontrolled limits, as long as the exposed person has been made fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area."

Williams was curious how the FCC wants broadcasters to make those in transient passage aware of the potential for exposure.

"I don't think this is a big problem," Engelman said.

The FCC will have to get more experience and see what is feasible as far as transient passage, he added. In the end, said Engelman, a sign reading "This is an area with strong RF fields —Don't Stay Long" might be all that is necessary.

The next step for the FCC is to update OST Bulletin 65, a guide with equations, charts and graphs that will show broadcasters how to comply with the new rule.

Engelman said the FCC will give industry experts a draft in September with 30 days to review it. The internal deadline for releasing it to the public is Nov. 15.

1996 Inductees for Radio Hall of Fame

CHICAGO The Radio Hall of Fame will induct five radio legends during a national radio broadcast and dinner on Oct. 27.

The 1996 class of inductees come from a broad variety of backgrounds. They include sportscaster Jack Brickhouse, FCC Commissioner James H. Quello, news anchor Susan Stamberg, talk show host Jerry Williams and disc jockey Wolfman Jack.

To several generations of Midwesterners,

Jack Brickhouse will be remembered as the voice of the Chicago Cubs and the Chicago Bears. WGN(AM) brought his folksy style to the Windy City in the early 1940s. In addition to the Cubs and the Bears, he brought the World Series, NFL Championship games and College Bowl games to national audiences.

Commissioner Quello is a veteran Detroit broadcast executive. His record

of accomplishments at WJR(AM) in Detroit established him as a leader in American broadcasting. His respect within the industry earned him an appointment to the FCC in April 1974. He has been reappointed and confirmed four times since then.

Born Bob Smith, the Wolfman Jack tasted his first slice of fame and adopted his trademark name while working at XERF(AM), a high-powered Mexican station, where he blasted a mix of rock and blues into North American airspace. The "howl" of the Wolfman was also heard on WNBC(AM) in New York, in the film "American Graffiti," and on NBC television as host of The Midnight Special. The Wolfman died last year.

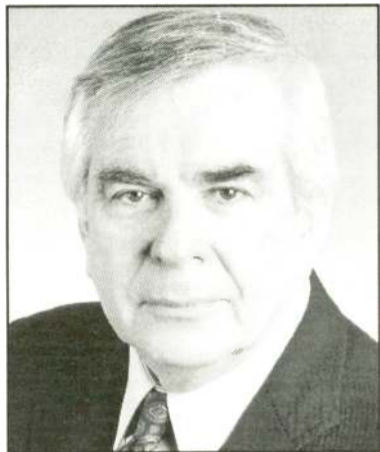
Susan Stamberg was the first woman to anchor a national nightly news program on a regular basis. She joined National

Public Radio in 1971 after holding several positions at WAMU(FM) in Washington. She hosted "All Things Considered" for 14 years and has also hosted the Saturday and Sunday editions of "Weekend Edition."

Talk show host Jerry Williams began his radio career at WCYB on the Virginia/Tennessee border in 1946. Known for his sharp intellect and pointed opinions, Williams fine tuned his style at WBBM(AM) in Chicago, WBZ(AM) in Boston and WMCA(AM) in New York.

He has been sharing his outspoken opinions and cheerleading government reforms in Boston on WRKO(AM) since 1981. Williams is the founder of the National Association of Radio Talk Show Hosts.

Casey Kasem will host the induction ceremony which will be carried coast-to-coast by the Westwood One Radio Network.



Clockwise, from top left: Susan Stamberg, Jerry Williams, Jack Brickhouse, Wolfman Jack



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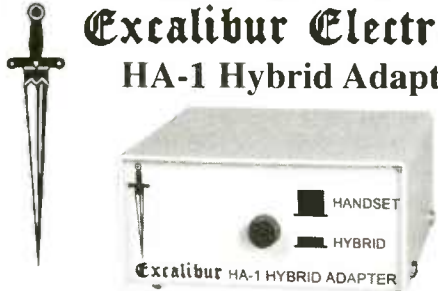
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ASCAP Bills Small Georgia Station \$30,000

Station Admits to 'Guessing' on the Annual Report but Was Not Prepared for the Tab

by Sharon Rae

ATLANTA An urgent bulletin marked "ZAP" sent sparks flying from Georgia to New York last month.

At the request of attorneys for the Georgia Association of Broadcasters (GAB) and a small-market station in the Peach State, a "GABulletin" was sent to all member stations.

The bulletin addressed a letter submitted by a small-market station which was audited by ASCAP in the fall of 1995 and then billed for more than \$30,000 plus interest.

Estimating and guessing

The small-town station wrote that during the audit, there was "very little dialogue and very few requests for explanations" from the auditors who studied the station checkbooks, bank statements, tax returns and political file before levying the bill.

According to the release, "station owners did admit to estimating and guessing

at some of the figures on the ASCAP Annual Report." They seemed surprised, however, at the \$30,000 dollar tab.

The station filed a disagreement with ASCAP regarding the audit, and according to the bulletin, has been negotiating since Nov. 7, 1995 "without success."

Meanwhile, the letter continues, "This small-market station's fees have gone to \$900 per month (not paid) and the interest grows. We have been told to pay or be in violation of copyright and performance laws."

At the end of the letter, the member station wrote, "This is the situation in a nutshell. Pay or don't pay it. How long are we going to put up with this screwing we're getting? Together we bring about a change, otherwise get ready for yours ...

We have been told to pay or be in violation.'

it's coming from all three." The author was presumably referring to ASCAP, BMI and SESAC.

The GAB office said it simply mailed the release to member stations in an effort to find out if this had happened to any other stations. It stressed that this was a request from a member station and the GAB attorneys.

ASCAP response

The bulletin includes a letter signed by the GAB executive director that requests Georgia radio station owners to respond "if this applies to you or if you have a similar situation ... GAB attorneys are looking into what can be done to help."

"If someone has a complaint, and they don't sign their name to it I'm always

continued on page 16 ►

Canada to Begin DAB

► continued from page 8

The reason for this limit is simply practicality, Stacey said. "If they tried to provide a complete service for some of these very wide-coverage AM stations, you would go too far with a single channel, and it would probably constrain the ability of the plan to serve everybody. They had to make a cut-off point."

Still, this limit is not absolute, Garforth said. If wide-coverage AM stations really want to, "they can apply for spectrum to go beyond that limit."

Of course, this would require convincing the CRTC that allowing such fringe DRB coverage would not hurt local stations in other communities.

So what happens next? With easy licensing and spectrum allocation in place, Canadian broadcasters need only to organize their pods, install Eureka-147 transmitting equipment and get on-air.

Of course, it would help if there was anyone listening. Except for a few engineers from professional DAB test receivers, no one can receive the digital signals.

However, this too should change soon, said Zeitoun, because "consumer-type receivers are expected to arrive in Canada by mid to late 1997."

When they do arrive (and assuming that consumers want to buy them — Canadian radio broadcasters should have everything they need in place to go digital.

□ □ □

James Careless, an audio producer, covers the industry in Canada for Radio World International. Contact him via e-mail at careless@magi.com

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GAB Station Protests ASCAP Bill

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suspicious about why they are hiding who they are if they've legitimately been done wrong," said Vincent Candilora, vice president/director of licensing for ASCAP.

"As for auditing, that's something that ASCAP does on a regular basis. Our licensee fees are based on a station's adjusted gross revenue, so we have to audit and we do."

Exaggeration?

Candilora said he thinks statements in the release are exaggerated "if the party is who we believe it is, and I believe we are correct in our assumption, because there is no one else in that entire state

that even comes close to this type of scenario."

Candilora also rebuked the claim that the station had been negotiating without any success since November 1995.

"That is not true because of the fact that we made an adjustment back in June. His fee is approximately \$450 per month, not \$900.

"That can clearly tell you that we have gone back and forth with this. There's nothing that they have sent us that has gone unanswered."

Candilora said the most upsetting thing about the whole situation is that the station's message got out and "it's not paid and we have composers and publishers whose music he is using on a regular

basis (and they're not getting paid. Our job is to make sure that they are paid."

Was it out of line for the GAB to send this bulletin to member stations?

"I wouldn't go that far," said Candilora. "We were surprised (the GAB) didn't contact us. We maintain very good relationships with all of the states, in particular with the GAB.

"I would have expected them to call and say 'I got this letter from a station ... is this fax correct? Have you got other problems like this?' I would think that is the kind of relationship that we try to achieve with state associations."

Pay for it

As for the station and its fine, Candilora

said, "They are using the property of our members ... that's their biggest raw material ... and anybody else who uses anybody else's property normally has to pay for it in order for them to even be able to use it and you make payment before you use it.

"Here's a case where people use the property and then (because it happens to be an intangible, someone's right (they go delinquent on payment."

Continued Candilora, "When you guess on paperwork for your audit on revenue figures ... that's outside the realm of good business I would think."

Candilora said he was surprised the situation got so ugly.

"We have been associate members of all the state associations for many years and I guess we expect that the relationship would work for both sides here.

The function of the state association is to try and help its members (broadcasters as well as associate members. I think they could have acted more as a mediator here than going to press with information they didn't even know was accurate."

One small market radio owner in Georgia who is not under scrutiny by ASCAP, but asked not to be identified, said the \$30,000 fine was way out of line.

Hard time

"The license companies, even though we play music to promote artists and promote their companies, could give a little small radio station a break of some kind. Small radio has a hard enough time as it is trying to make ends meet without something ridiculous of this nature being performed."

If someone has a complaint, and they don't sign their name ... I'm always suspicious about why they are hiding who they are.

— Vincent Candilora
Vice President/Director of
Licensing ASCAP

The small station owner admitted the management should have been more accurate with its figures, but added it "doesn't seem to warrant a \$30,000 fine. This is a country in which we believe in live and let live and I don't think anybody is trying to cheat anybody out of anything.

"We little small town radio stations try to serve our people in the public interest and we can't do it if they break us."

He added "One and a half percent to reach \$900 is a wheelbarrow load. I wish I billed enough to pay \$900 a month. I'm just striving to make a living, keep my bills paid and keep ASCAP, BMI and SESAC as happy as possible."

Speaking as a long-time broadcaster, he said, "I've seen all these things go around and around and it is something all the time to take some money. (Radio stations) are having to pay fees for things we didn't used to have to pay fees for. It's just gotten out of hand."

□□□

Sharon Rae is principal of Rover News Services in Michigan, reach her at e-mail: SCohon@aol.com

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 World Radio History

WORKBENCH

Sensaphone Saves Money and Time

by John Bisset

SPRINGFIELD, Va. Long-time readers of this column and of RW will remember the "Sensaphone," a unique device discussed here between five and 10 years ago. It was a simple remote call-out device designed to provide "home security" by calling a pre-programmed number or numbers when alarm conditions occurred.

What made this device unique was its price; it listed for around \$250. After installing it at a remote transmitter location, you could query the Sensaphone to obtain temperature and AC power "on" condition, and "listen" to the room noise using a built-in mic.

I remember one engineer calling his site and hearing the screech of a blower motor bearing. He got to the site and replaced the PA blower, avoiding a catastrophic situation.

Another chief suspected a jock of tampering with the processing settings at the transmitter site. The Sensaphone alerted him to an early morning adjustment session. He drove to the site with the program director, and the jock was history.

The spare contact closure, usually used

for an entry alarm, caused the Sensaphone to call out silently to the pre-programmed number should anyone enter the site.

I last heard about Sensaphone when a colleague called to tell me that the local discount store was selling them for a hundred bucks each. Gulf+Western apparently was discontinuing the product, and the store wanted to unload its stock. We bought a dozen, and placed them at the various transmitter sites we serviced. They have proven themselves over the years.

Just recently, in response to a reader reply card to an electronics magazine, I spoke with Jessica Forrest of Phonetics Inc. It turns out that the inventor of the Sensaphone left Gulf+Western when the company discontinued the product, and continued building and improving it under the Phonetics name. The basic Sensaphone costs less than \$400, and has some added features.

The company now has an entire family of monitoring products, from the simple to the complex. The basic Sensaphone models 1104 and 1108 remain available. But the company has added one that provides relay contact closure, controlled

over the telephone.

Stations with intricate, state-of-the-art remote control systems may find that these features duplicate their transmitter remote control. For managers using older remote control systems, the availability of the Sensaphone is great news.

These older systems rely on jocks to notice any alarm conditions. A system that will call you, the engineer, when something goes wrong is a big help.

The Sensaphone goes a step further than products that provide DTMF-control over a dial-up telephone line. The control features are nice, but the ability to monitor AC power, temperature, sound level, and up to eight dry contact inputs is useful to the engineer who must maintain newly acquired sites or LMAs with no additional help.

One application jumps to the forefront based on a recent incident. A client had a remote relay site for a two-hop STL, with scheduled monthly visits. The STL equipment was routed through a UPS for backup purposes. A major failure in the UPS, however, caused the equipment to fail when the UPS would not bypass. A Sensaphone would have started calling when the UPS alarm sounded, giving us time to correct the problem before the shutdown.

I'm sure you can come up with a variety of applications yourself. If you buy the box, let me know your experience. Your printed submission will qualify for SBE recertification credit.

If you need some collateral material to sell your boss on the concept, Phonetics offers a thorough catalog that describes each of its models. You can get a copy by circling **Reader Service 30**, or faxing your request to Jessica's attention at (610) 558-0222.

★★★

Joe Schloss is chief engineer for Great Lakes Broadcasting in Iowa. He recently put in a new solid-state IPA in his Harris FM25K. In the setup procedure, he noticed some steps that could use some clarification.

In step 7, you are asked to remove the wires 27, 28, 29 from contactor K2. These wires power the factory IPA that came with the transmitter when it was new. You are asked to insulate and dress them out of the way. Then, in Step 8, hook the two wires that go to the new IPA to the contactor.

Joe changed this slightly. He put in a locking-type "Molex" plug on the three wires that were removed from the contactor which ran to the original IPA. He installed a second plug on the wires that go to the new replacement IPA. A short jumper cable with a corresponding female plug was then wired to the contactor. This arrangement will make the conversion quicker if Joe must ever reinstall the original IPA.

The instructions also ask you to "float" the cable that comes out of the original IPA, which carries the RF. Joe ran this cable into a 150 W dummy load, as a precaution should the old IPA get AC power applied with the RF cable not properly connected. Keeping the original IPA in place makes for fast conversion as a backup. Joe recommends, however, that you place the backup IPA output into

some kind of dummy load, even if it is a cheap oil-filled type. The original IPAs have no foldback protection, and you will lose modules if the unit is run into a no-load condition.

★★★

I am going to wrap up this column with what I consider the invention of the year. How many times have you had to repair a cable or wire, soldered all the conductors and then realized you forgot the pieces of heatshrink that were to insulate the conductors? Or, better yet, you remembered to put the shrink on the wire, only to have it shrink in place due to the heat of the solder connection?

For me, it has happened more times than I want to remember. Although electrical tape will work, it's not pretty, nor does it wear well. I needed a piece of shrink that I could apply to a wire after soldering.

The folks at Alpha Wire Corp. have come to the rescue! This innovative addition to their line of FIT shrinkable tubing is called FIT WRAP. These are adhesive-lined shrinkable sleeves that you wrap around the wire or cable, then shrink down using a heat gun. The FIT WRAP will insulate conductors to 600 V and provides strain relief and an environmental seal that assures complete waterproofing and protection from abrasion and corrosion. Obtain more information by contacting Alpha toll free at (800) 52-ALPHA, or by circling **Reader Service 65**.

□□□

John Bisset is a principal in Multiphase, a technical services company based in the Washington suburbs. Contact him on line at WRWBENCH@aol.com or at (703) 323-7180. Faxed Workbench submissions should be sent to (703) 764-0751. Published submissions qualify for SBE recertification credit.

62 Years Ago

Reprinted from Radio World
(September 15, 1934).

Editor's note: The RW of old, printed for a time in the 1920s and 1930s and today's RW are unrelated except in name.

New Tack Being Tried to Win Public's Favor

A few years ago semi-automatic tuning was tried by some manufacturers, but it did not prove popular. It seemed to be one of those inventions the necessity for which was felt more by the inventor than by anybody else. It consisted of a device whereby levers were set for particular stations, so that to tune in the desired station the lever was pulled, instead of the dial being turned. Tweedle-dee and tweedle-dum. And the depression was just in its infancy.

Now another system is being tried, and one manufacturer has a clock mechanism and motor combination, so that the receiver may be present to bring in programs at the desired time. All one need do is to plug in the different tips and the day's programs are selected in advance; the set automatically turning itself on and off, as directed by these preparations. That is quite a different matter and might catch on, as a service actually is rendered.

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Circle (43) On Reader Service Card

FOCUS ON TRANSMISSION

Transmitter Manufacturers Eye DAB Progress

by Alan Haber

WASHINGTON IBOC, IBAC, Eureka, DARS: The alphabet may not contain enough letters to identify a digital audio broadcasting (DAB) solution acceptable to everyone. Transmitter manufacturers, like others in the broadcasting business, must peer into an unclear future.

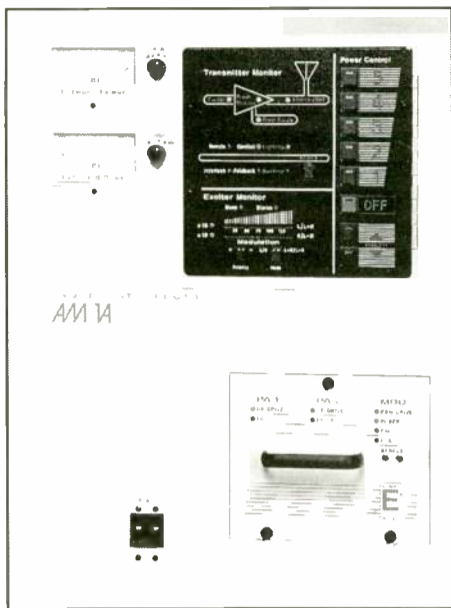
Eureka-147 seems to be the system of choice elsewhere, but no clear winner has emerged in the United States. The National Association of Broadcasters favors an in-band, on-channel system. Some observers think the industry should hitch onto the Eureka bandwagon, others that broadcasters should choose a satellite or in-band, adjacent channel system.

The answers may emerge after completion of DAB field tests. Meanwhile, transmitter manufacturers must continue to conduct business and try to sell their products.

Compatibility

Some customers are asking about compatibility: Will transmitters purchased today be compatible with DAB tomorrow?

"It seems like there is more interest in the DAB possibilities and more concern about transmitter compatibility" coming



The Broadcast Electronics AM 14

from AM customers than FM, according to Geoff Mendenhall, vice president and radio product line manager for the Harris Broadcast Division, an exhibitor at the upcoming World Media Expo in Los Angeles. "It's been good for us, in terms of AM transmitter sales," he says, "because I don't think anybody's been holding back or worried too much about

DAB compatibility, if and when it comes for AM."

When will DAB get going in the United States? Mendenhall predicts "the adoption of DAB implementation in the U.S. is going to lag Europe and some other countries, including Canada, by quite some period of time."

The broadcasting industry is taking a "wait-and-see attitude" about DAB, says Ernie Belanger, vice president for marketing at Energy-Onix. Until a system is chosen, he suggests that broadcasters don't have a choice: If their equipment needs to be upgraded later, "they have to upgrade," he notes.

Belanger says customers ask frequently about the compatibility issue. "Our equipment, at this point," he says, "is compatible with every in-band digital scheme that we've seen."

At Broadcast Electronics, another exhibitor at WME, director of RF and studio products Tim Bealor reports a low number of such inquiries, which he says doesn't really surprise him.

"We've worked with the people on most of the major DAB proposed systems," he says, "and we find that the longer it drags out, the less that the end users can afford to wait to buy product. ... They have to get something and get it on the air."

BE is preparing for the eventuality of DAB. "What we are trying to do is keep enough presence or gather enough technical data and do some very basic research into our existing product (to determine)...how (it) will be compatible with all of the DAB systems," says Bealor, "and then also try and watch very carefully technical results of the testing to try and make a determination ... of which one of these systems is the most likely to become a reality."

Regardless of which system will eventually emerge as a standard, BE, like other transmitter manufacturers, must face the realities of business in the present. The company, says Bealor, tries to "put as few barriers as we can into our product designs to these systems. However, we won't compromise the designs that we're doing now, that work with the current technology, to make them DAB compatible, because you know the customers buy product that has to work with their current systems for some number of years."

Bealor says BE would be doing its customers "a disservice ... to ask them to accept a less than desirable product just so they can, at some point, be compatible with DAB in whatever final form it takes."

continued on page 63 ▶

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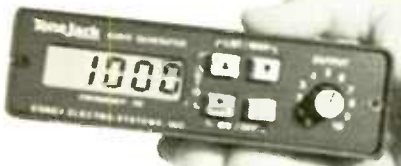


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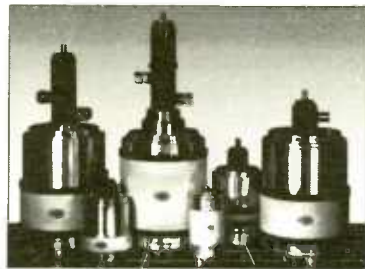
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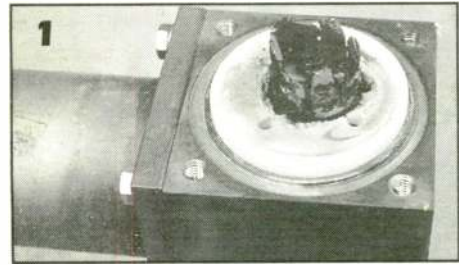
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Know Your FM On-air Transmission

by Thomas Silliman, David Davies and James Kemman
Electronics Research Inc. (ERI)

CHANDLER, Ind. This article will discuss the elements of an FM transmission system, with particular attention to potential problems.

A simplified FM transmission system includes a transmitter, a transmission line and an antenna. The transmitter converts



Electrical Bullet Damage By Heat

60-cycle (60 Hz) alternating current electrical energy to radio frequency electrical energy. In the case of FM, the new frequency is between 88 and 108 Megacycles per second, or MHz.

The RF or radio frequency energy is conducted by means of the transmission line to the antenna, where another conversion occurs. The antenna is designed to lose all of the RF energy. This loss is not in the form of heat but rather in the form of Radiated Electromagnetic Field energy. We can view the antenna as a device that changes

energy propagation through a conductor to energy propagation without a conductor.

If the antenna provides a perfect conversion, all the energy leaves the system in the form of radiated energy and none is returned to the system through the conductors. If the conversion is not 100 percent efficient, the losses appear as reflected RF energy of the same frequency or as heat energy.

Any physical change in the transmission line or antenna can reduce the conversion of conducted energy to radiated energy. An imbalance results, generally producing an increase of reflected RF energy with consequent increased stress in every part of the transmission system. The stress causes conversion into heat energy, whether by the I²R loss or by dielectric loss. This stress is caused by higher peak voltages and currents in the system. The increase is the sum of the forward and reflected voltages and/or currents which

are occurring at the same frequency. The term VSWR (voltage standing wave ratio) quantifies this effect.

In both cases, heat results. As the system converts increasing amounts of RF energy to heat energy, further physical changes occur which in turn accelerate the conversion. The meltdown process begins

and the cycle continues until the supply of RF energy ends.

Failure at a connection is perhaps the most common mode of system failure. The electrical connections between the transmitter, transmission line and antenna

typically consist of friction connections between a male "bullet" and a female inner

conductor. This forms an expansion joint. Excessive antenna support motion or system temperature change can wear the electrical contact areas.

This can cause galling (uneven wearing) to the surfaces of both the bullet and inner conductor. Such galling reduces the available contact resistance, an increased I²R loss and a partial conversion to heat energy. The increase in temperature can produce meltdown. An example is shown in photo 1.



Lightning Damage to Rigid Line Section Causing an Internal Arc

Another possible outcome of connection degradation is an accumulation of conductive residue on the insulator between the inner and outer conductors. Small particles of the silver plating on the bullet or the copper skin of the conductor can form a conductive path

across the insulator. Once this path is complete, the system is effectively shorted. Again, heat and further degradation result.

Water can cause connection failure. It can enter the transmission train by several means. A loose system joint is the most probable. Improper installation or a combination of ice and wind forces can produce misfit connections; other methods



Propagation Arc Damage to Inner Conductor

of entry include holes in the line or antenna from lightning strikes or rifle bullets. Excessive tower movement or vibration can cause stress cracking in the rigid line sections. Photo 2 is an example of lightning damage to a rigid line section and a subsequent internal arc.

Water, considered essential for life, is death to the transmission train. In a gas form, water (H₂O) is lighter than oxygen (O₂) or nitrogen (N₂). Water vapor "floats" on air, which is why we purge the antenna at the top. If the transmission system can "breathe" or take in the "wet" air, water enters the system.

The water vapor will remain in the upper parts of the system in a gaseous form until sufficiently cooled. As the vapor condenses, it can accumulate as a liquid on the internal insulators between the inner and outer conductors and cause insulator failure. The water can also pool in lower portions of the system and fill

continued on page 64 ▶

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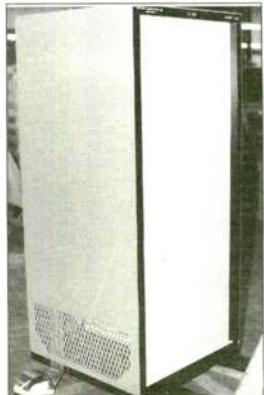


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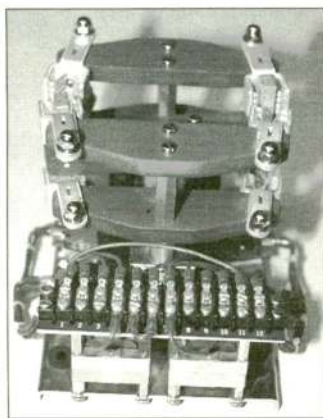
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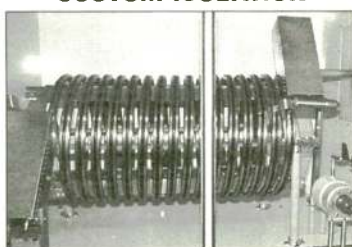
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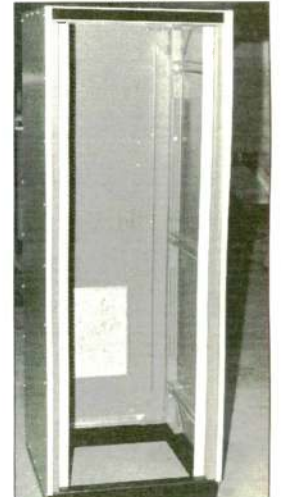


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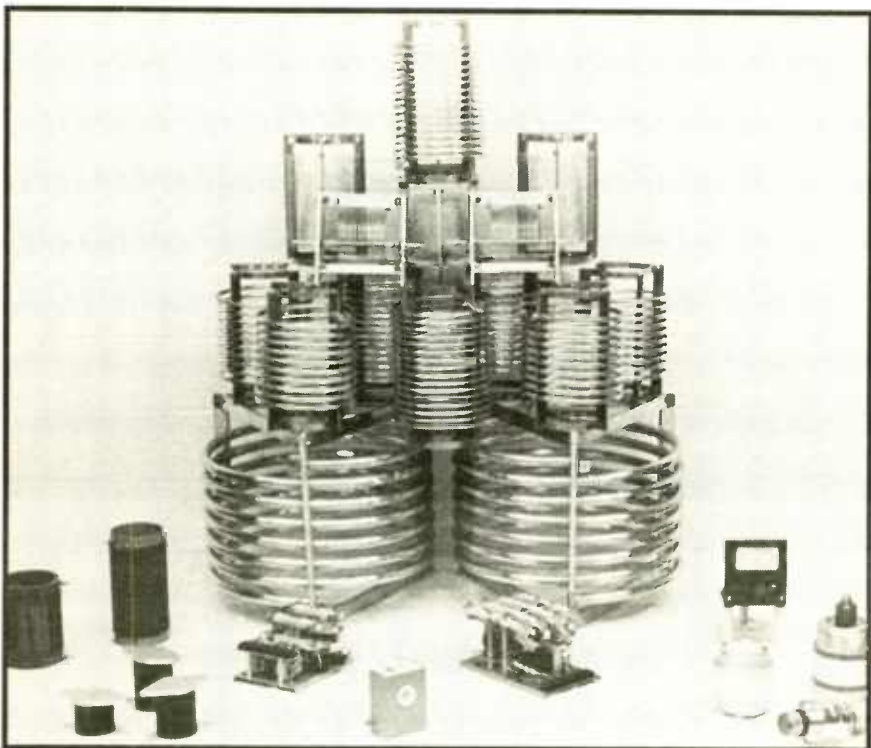
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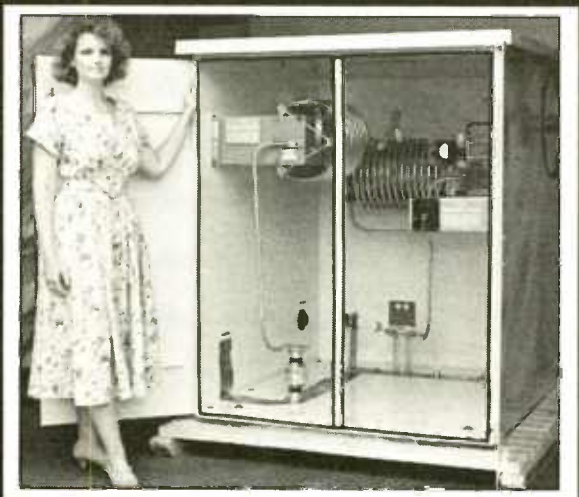


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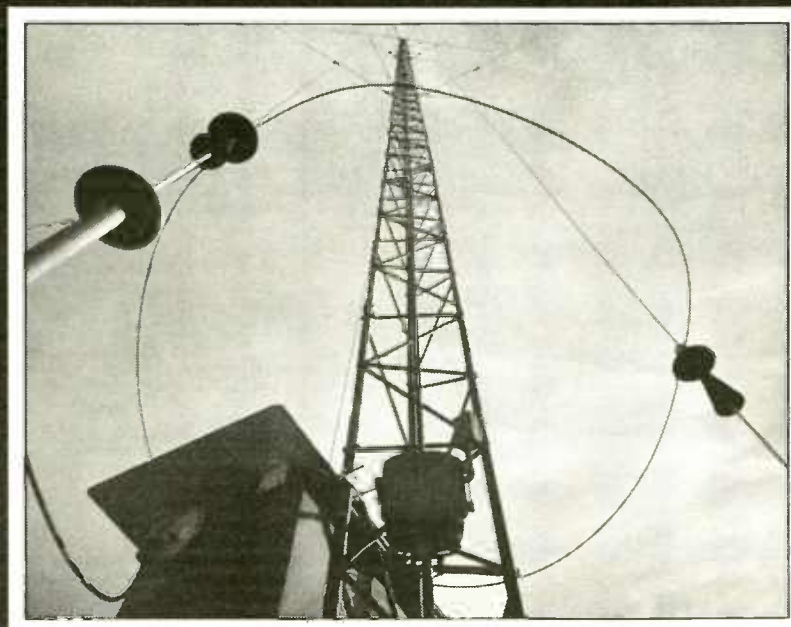
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Sniffing for Intermittent Leaks

by Troy Conner

BRASSTOWN, N.C. Transmission lines seem to fall into two distinct categories. They are either "transparent," in which case you are usually unaware of their existence and function, or they are downright troublesome. Particularly temperamental are some of the older or poorly installed rigid coaxial systems common on larger FM towers.

The pressurization of a transmission line and the application of gases of high-

finding pesky, intermittent leaks.

I left our office in western North Carolina at about 3 a.m. so that I would arrive at the tower at about 6 or 7 a.m., just about daylight but still good and cold from the previous night. I intended to perform a "T-Line Sweep." This involved searching for a mystery leak that had defeated two previous tower crews, so I was not optimistic. At least the weather was cold and clear, and I was glad to note, free of snow.

As the low January sun broke over the rolling eastern Tennessee hills, the temperature hit about 10 degrees and the time to start climbing had come. The 300-foot tower served as both an AM

radiator and a stand-by FM site. Bundled in insulated coveralls, knit cap, safety harness and neoprene gloves, I found the climbing slow and cumbersome. In the bolt bag on my harness, I carried a miracle of modern technology, miniaturization and specialization: an Accutrak VPE-100 Ultrasonic Leak Detector. On my head I wore full-cup headphones plugged into a cassette-sized sensor/display in my pocket. The sensation of climbing in silence, without wind noise, was eerie and a bit disconcerting.

Having only used the unit twice, I was leery as to the effectiveness of our \$600 investment. We had purchased it out of desperation in an attempt to bring leak

detection into the 20th century. An ultrasonic leak detector electronically listens for and isolates the sound a leak makes. We had researched a number of such detectors before choosing one that matched our budget constraints and need for low-pressure sensitivity. The Accutrak unit promised to locate leaks as low as a single PSI, but no one could tell us how the detector would perform on a tower in high wind.

At the first joint in the 3-1/8-inch rigid line, I tried both new and old technologies. First, I sniffed around the entire joint with the leaked detector and found nothing. I pocketed my new gadget and dug into my bolt bag for the old soap and brush. A problem was immediately apparent when the soapy brush hit the copper flanges. Although the air

continued on page 60 ►



er dielectric strength can significantly increase the peak power handling capacity of the system. To varying degrees, desiccated air or high-density gases such as Freon 116, sulfur hexafluoride or plain old nitrogen all offer increased peak power ratings at increased pressures, ensuring a lower variable quality signal, and better market coverage.

While pressurized systems offer dramatic performance advantages to the broadcaster, they also introduce a potential headache with which station engineers are too familiar: the dreaded T-Line Leak. Is moisture getting into the line? What about voltage breakdown (arcing) between the inner and outer conductors?

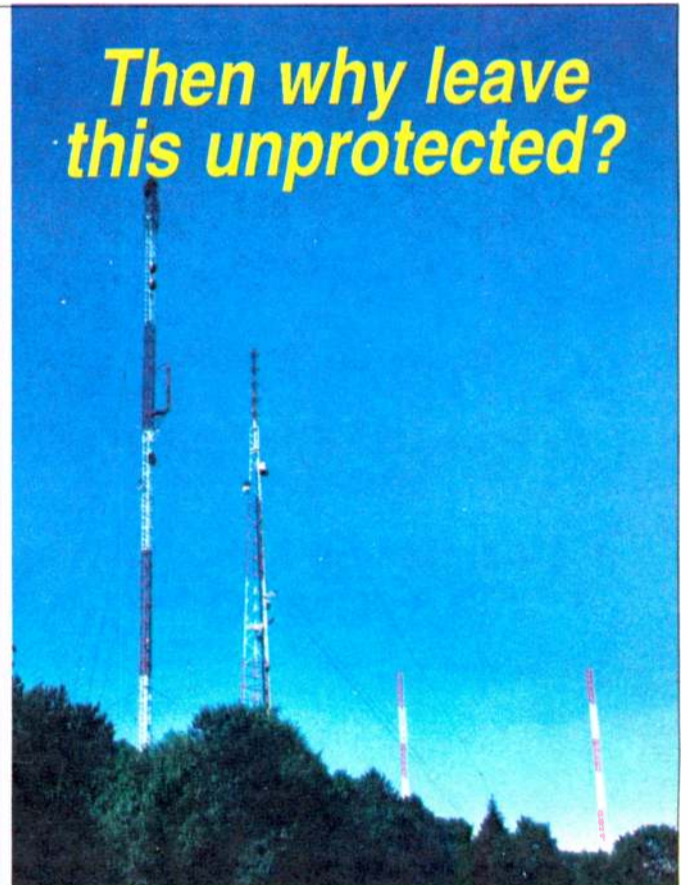
This article focuses on pressurized rigid transmission lines and particularly on tracking down those puzzling intermittent leaks. Often subtle in nature and mysterious in origin, these are the kind of leaks that can drive an otherwise sane and rational engineer or owner absolutely nuts.

Typically a leak appears without warning, completely emptying a tank of nitrogen over a weekend. After much cursing and consternation, the crew has installed a new tank. The leak has suddenly disappeared. Will it hold? One day, two days, a week pass, and someone finally says, "Well, it seems to be holding."

With sighs of relief, all concerned return to more mundane daily affairs. Six months later, during a routine visit to the transmitter site, the engineer finds that the tank gauge is again on zero.

"#@&^(!!" It's baaaceck.

To find a transmission line link in the past, a tower climber would spray or paint each fitting in the system with liquid detergent while looking for the tell-tale bubbles indicating a leak. This is a task requiring the patience of a monk, in a setting not terribly conducive to such meditations. While recent advances have added a valuable tool to the belt of the modern tower technician, I relate the following story to show how important the station managers and engineers are in



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World Radio History

How to Keep a Transmitter Happy

by Tom Osenkowsky

BROOKFIELD, Conn. Heat and dirt are the deadliest enemies of a transmitter.

To deliver a quality signal to the audience, your station needs a properly operating transmitter. It is an active device, requiring electric power to generate an AM or FM signal. Most transmitters have a cooling system, usually forced air produced by a blower or fans. You've heard this a million times: Keep the air filters clean and vacuum out the transmitter regularly.

Some transmitters have proved reliable workhorses over the years while others have not fared so well. How can you

prevent transmitter failure? When does a new transmitter purchase make sense? First, let's see how we can get the most out of what we have.

Start with the air

We need fresh air to breathe. So does a transmitter. If we leave a transmitter in a confined area without a source of new, fresh air it, too, will suffocate.

Many transmitter buildings have inadequate air intake supplies. Perhaps the windows or vents were boarded up to prevent unauthorized entry or to keep out rain. Maybe the ceiling fan failed, the automatic louvers jammed shut, or the building air filter clogged. Fresh, clean

air circulation is important. Maintain and monitor the transmitter air system. Service all air filters regularly. Don't forget to clean honeycomb filters inside the PA cavity and clean each fin on the blower fan painstakingly. A coating of dirt on the fan fins can reduce airflow by 20 percent.

With careful use of forced air, you can clean a tube socket and areas not otherwise easily accessible except by disassembly. Be careful not to force air past critical components such as open-wound coils which could become distorted by the air stream. Also remember that in many tube FM transmitters, connecting straps also serve as tuning components.

For tube-type transmitters, the measure of PA efficiency can be a useful indicator of overall performance. I was called in recently to look at a new FM facility that had antenna problems. The transmitter efficiency was only 55 percent and the PA dissipation measured 3,262 W. That is, the PA voltage was 4,900 V and the PA current was 1.48 amps. The forward output power indicated 3,990 W.

Further investigation revealed that the transmitter was severely out of tune. Simple retuning yielded the following: PA voltage was 5,000 V, PA current 1.05 amps, and PA dissipation 1,340 W. The efficiency rose to 74.5 percent. Obviously this PA tube had burned off excessive and unnecessary heat.

Another indicator of transmitter performance is airflow temperature. Some engineers place a thermometer in the air duct above the PA tube(s) to keep an eye on the air temperature, which can serve as an early warning measurement. Overheating line joints, elbows, and — especially — harmonic filters are signs of trouble. I should note that this same transmitter had an output connector that was too hot to handle. The problem was a misaligned output-feed inner conductor. Repair lowered the VSWR by 1.12.

The real enemy

Many writers have addressed filament-voltage management and its effect on tube life. Power tubes draw very high filament currents. As in any circuit, loose connections are a real enemy here. Make certain all connections from the filament transformer up to the tube socket are tight. When measuring filament voltage, make sure all DC and RF voltages are off. This means the exciter. Measure the filament voltage at the tube socket. Never depend on the filament-voltage meter on the front panel.

When installing a new tube, run the filament voltage at rated value for the first hundred hours. It is good practice to degas the tube prior to applying high voltage (let the filaments only run for an hour or so). Throttle back the filament voltage after a week to 90 percent of rated value or to the point you notice an output power drop. Maintain this voltage until you must raise it incrementally to maintain power. High filament voltage can decrease tube life more than 50 percent. Low filament voltage can also cause internal tube problems, so proper maintenance of filament voltage is essential to peak performance and long tube life.

Several years ago, I worked on a 20 kW FM transmitter that huffed and puffed just to make 18 kW, even with new tubes. The problem was very low filament voltage on both the PA and IPA tubes. Resetting the filament voltages to proper value caused the power to exceed 22 kW because the engineers had raised the plate voltage just to make power. The lesson: don't trust the filament meter. That's why it has a calibration control.

The time will come to consider replacing a transmitter. Overall efficiency, the amount of electrical power necessary to run the transmitter, is a key factor today. Solid state transmitters, especially in the AM service, are extremely efficient. FM solid state transmitters are not far behind. When considering a new transmitter, examine the overall efficiency. Factor in the costs of tube replacements and components. The latter can be important if the present transmitter is old. You may find that a new transmitter will pay for

continued on page 27 ►

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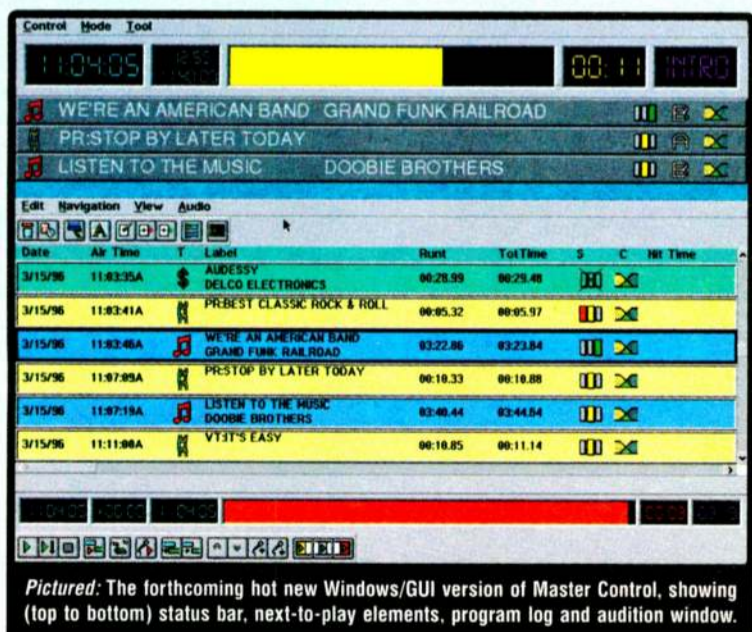
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AM Antenna Resistance Matters

by Tom Vernon

HARRISBURG, Pa. AM stations must determine operating power by the direct method, in which the square of the antenna current is multiplied by antenna resistance. We calculate these figures when first erecting and tuning the antenna. In today's deregulated environment, broadcasters often give little subsequent thought to antenna resistance measurements. Our topic this month is how to determine antenna resistance and interpret the results.

Antenna resistance is defined as the total resistance of the transmitting antenna system at the operating frequency and at the point at which antenna current is measured. For directional stations, this is the common point. Antenna resistance depends on the effective height of the

those taken after the equipment had been off for a while.

The coming of the OIB in the mid '60s allowed the measurement of impedance with the transmitter operating. Many felt that these dynamic measurements gave a more accurate representation of what was happening.

Table 1 lists typical antenna resistance measurements for various conditions. While some minor seasonal variation in readings is normal, drastic shifts in antenna resistance are a sure sign of trouble. The savvy engineer will heed the warning and track down the problem before a major crisis befalls the station.

When antenna resistance changes drastically, particularly after rain, the ground system is a prime suspect. Radials oxidize over time, solder joints break down and copper thieves come in the middle of

performance by effectively reducing the base height above ground, thus altering antenna impedance.

Another source of trouble is cracked or

Base insulators deserve a careful inspection.

broken guy insulators. Be especially wary of the insulators at the top of the tower, the hardest to see from the ground. If they fail, they can short the top section of guy wire to the tower. Under some circumstances, this can effectively top-load the tower and actually improve

efficiency, but the commission does not look favorably upon this. Regular inspection of the tower by a reputable firm will identify most of these problems.

Stations with a directional antenna system may also have phasor equipment problems that can disrupt the base impedance. This complex matter warrants a separate article.

By making accurate, regular antenna resistance measurements, you will determine operating power with confidence and receive early warning of an impending disaster that could cause an outage if not handled quickly.

□ □ □

Tom Vernon is completing his Ph.D. at the University of Pennsylvania in Philadelphia. You can e-mail him at TLVernon@aol.com; or call (717) 367-5595.

Table 1 Typical antenna resistance and reactance values. (Source: Ennes: AM-FM Broadcasting)

Antenna Height (Electrical Degrees)	Self-Supporting Towers		Guyed Towers	
	Resistance (Ohms)	Reactance (Ohms)	Resistance (Ohms)	Reactance (Ohms)
50	7	-j100	8	-j222
60	9	-j70	13	-j170
70	14	-j25	19	-j175
80	20	+j11	28	-j28
90	40	+j35	36	+j0
100	60	+j80	80	+j140
110	90	+j90	140	+j320
120	175	+j80	220	+j500
130	190	+j15	370	+j600
140	165	-j70	660	+j480
150	130	-j85	1100	+j0
160	82	-j55	550	-j250
170	60	-j25	280	-j450
180	40	-j5	180	-j500
190	28	+j25	120	-j430
200	23	+j50	80	-j400

antenna, its shape and its operating frequency.

The term "resistance" can confuse, because it is not a value we can determine with an ohmmeter. It is a fictitious measure of the equivalent resistance, which if inserted in the antenna would dissipate an amount of power equal to that radiated from the antenna.

Although antenna resistance can fluctuate, the FCC only used to require the calculation when proofs were made. Thus many stations may rely on antenna resistance measurements that are several years old to make power calculations. It's a scary thought.

Bad assumption, bad outcome

Imagine this scenario: The antenna resistance has increased over time, but the station is still using a lower figure in its calculations. The operator on duty increases power to maintain licensed antenna current. This puts extra stress on the transmitter, possibly resulting in an overload. It may also make the station liable for a citation from the FCC for operating in excess of licensed power.

Measuring antenna resistance is a matter of using a properly calibrated RF bridge or Operating Impedance Bridge (OIB). In times past, the *de facto* standard was the GR RF bridge. It was very accurate, but disparities often arose between hot and cold measurements. Those taken immediately after equipment was powered down were different than

the night. The solution may be as simple as repairing some bad solder joints or burying unearthened radials, or as drastic as replacing the entire system.

Isocouplers for FM or STL antennas mounted on the AM tower are another source of trouble. Over time, their grounding connections can loosen, resulting in either a high resistance path or no connection between the transformer and tower.

Good engineering practice dictates that the installation crew bond all the sections of a tower together when it goes up. Sometimes this doesn't happen; at other times the welded joints develop hairline cracks after years of flexing in the wind. A badly rusted tower may benefit from a one-half-inch copper braid that runs its length, bonded to the tower every 6 feet or so.

Base insulators deserve a careful inspection. They can crack or fill with water when the drain holes become plugged. Squirrels or other small animals may meet an untimely death when they seek shelter under the skirt of the insulator, and must be removed.

Chokes take a beating from lightning strikes, and just grow old. Windings can short together, or the bypass capacitors can break down. These changes will interfere with the isolation between AC lines and the tower, disrupting antenna impedance.

Control plant life around the tower for a distance at least equal to the tower height. This isn't just a matter of neatness. Heavy vegetation can degrade



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FEEDLINE

The Ground System: Vital for AM

by W.C. Alexander

Part III

DALLAS Beneath every AM antenna system is a ground system (or at least there should be).

Without a copper or otherwise conductive ground system, the losses in a vertical AM antenna are high. These losses are due largely to the conduction of currents through the earth, which at best has a high resistance. By burying a number of wires from near the tower base to radial points some distance away, we provide a relatively low resistance path for the ground currents to return to the ground near the tower base.

While we could use other materials, copper is by far the best compromise for performance, durability and economy, and for this application is used almost exclusively.

Ground currents and losses

Did you ever wonder about the return path for all that current flowing in your AM tower? These currents leave the antenna as displacement currents, then flow through space and finally into the ground, at which point they become conduction currents. Due to skin effect, they usually flow very close to the surface as they flow radially back to the antenna base.

One part of this current flows through the earth itself; the remainder flows in the buried wires. This can be viewed generally as a parallel resistive circuit.

As the ground current flows inward through the ground or the wire toward the antenna base, displacement currents from the antenna, flowing into the ground, join it. Because these additional currents differ in phase from the components already flowing in the ground and from buried wires, the ground currents do not necessarily increase.

Studies and years of experience reveal that the ground currents at a distance are proportional to the antenna field strength at one kilometer, or the inverse distance field (IDF). The studies further established that the current flowing in the ground radials at distances greater than 0.3 wavelengths from the tower base remain relatively constant for varying heights of antennas with a constant input power. The power lost in the ground at distances greater than 0.3 wavelengths will generally be the same, regardless of antenna height.

But near electrically short antennas, ground currents become quite large. Knowing that the power lost in a conductor is directly proportional to its resistance, we understand the importance of maintaining a good array of ground conductors within one-quarter wavelength or so of a short antenna. The losses in a ground system for a one-quarter wavelength tower can easily reach 3 dB or more if many radials are missing, cut or deteriorated. The shorter the tower, the more pronounced the ground system losses become. This is one reason electrically longer antennas are desirable.

Many years ago, experimenters looked at the effects of the number, size and length of radial ground wires on antenna resistance and field strength at a distance (efficiency) of AM antennas of varying heights. They concluded:

- The distribution of currents depends on the wire size in a logarithmic fashion, making the size of wire relatively unimportant.

- The losses in a ground system are inversely proportional to the number of radial wires used.

- The resistance of an antenna of a given height is reduced as the number of radial ground wires is increased.

- The reactance of an antenna varies only slightly with differences in the ground system.

- The efficiency of an antenna is increased with the number of ground radial wires used, with 120 wires the optimum balance between cost and efficiency.

- The optimum length of a ground system is 140 electrical degrees.

- The presence of a ground screen in the vicinity of the antenna base makes no difference in antenna resistance or efficiency.

- A buried radial ground system functions equally well as one with the same number and length of radials, but installed above the surface.

Largely as a result of these experiments, the standard nondirectional AM antenna ground system was defined as 120 radials, 90 electrical degrees in length, composed of No. 10 soft-drawn bare copper wire buried 6-8 inches below the surface.

A copper screen 25 to 50 feet square (or a system of 120 interspersed 50-foot radials) in the vicinity of the tower base is also part of the standard ground system, notwithstanding the conclusion noted above. Its purpose: to stabilize the resistance of the antenna and the capacitance across the base insulator in the presence of changing ground conditions due to weather, moisture content and the like.

For directional antennas with multiple towers, the same basic ground system elements are used. However, where radials from different towers intersect, they are terminated into and bonded to a transverse copper strap. For example, in a two-tower array with one-quarter wavelength spacing, a transverse copper strap would be installed halfway between the towers, and all the radials that would intersect the radials of the other tower would terminate onto the transverse strap.

Ground currents return to the tower base radially in a single-element AM (nondirectional) antenna. In multi-element directional arrays, displacement currents arrive at every point on the surface of the ground from each element of the array, and their components all have different phases. The current flow in such a multi-element array will not, then, be entirely radial.

Recent experiments indicate that ground currents in multi-element arrays often flow in a spiral fashion toward the individual tower bases. In the early 1990s, a complex rooftop ground system for a five-tower directional array was constructed using a grid rather than radial pattern. The efficiency and stability of this unconventional ground system proved quite satisfactory.

Lightning protection

A buried copper radial ground system, effective as part of a vertical antenna system, seldom is satisfactory as a mechanism to dissipate the energy from lightning that strikes a tower. When large lightning currents flow through them, individual radials can burn in two at the point of connection to the tower base strap. A separate large conductor wire, 0 AWG or larger, is needed to discharge strike currents. Connect this conductor to an array of at least four 8-foot copper-weld ground rods near the tower base pier.

Insulated-base towers need some method of discharging static across the base insulator, such as a static drain choke, which has a high impedance at the RF operating frequency but a very low impedance to DC. Towers that use sample loops at tower potential must use sample line isocoils to isolate the loops from the sample line at the operating RF frequency. These isocoils serve well as static drain chokes.

Such chokes prevent dangerous static potentials from building up on an insulated tower but they are not effective at dissipating lightning strike currents. In fact, they present a very high impedance to the extremely fast rise times of a typical lightning current. A spark gap directly across the tower base insulator is required, providing a path for such

lightning currents.

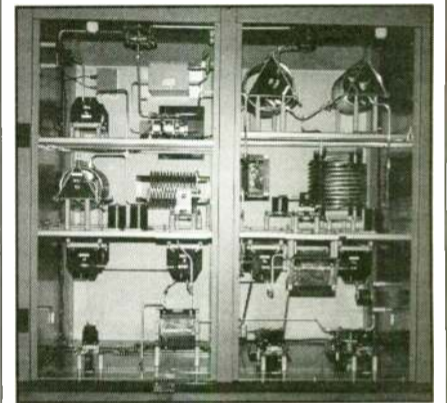
Gaps of this sort most often consist of two horizontally separated galvanized steel balls with an air gap between them, located just below the base plate of the tower. "Horn" type gaps are used in other installations, and from time to time, a "needle" gap is used. In the ball and horn type gap designs, any arc across the elements is self-extinguishing. As the sustained arc climbs farther and farther out on the gap, the spacing gradually increases until the voltage across the gap is less than the breakdown voltage of the air between the points where the arc is occurring. The arc is then extinguished.

□ □ □

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► continued from page 24

itself in power savings alone within five to seven years.

If you are relocating a transmitter site, new models may require only single-phase power rather than three-phase power. Although slightly less efficient, single-phase can be far less costly to install in remote areas.

A newer concept in FM transmitters and excitors is frequency agility.

With many consolidated stations, some broadcasters opt to buy a single transmitter to serve as a standby for several co-located or near co-located stations. Should a transmitter fail, this standby can be set quickly to the proper frequency and placed on the air.

Don't forget the antenna system

when examining the transmitter plant. It too is important in delivering reliable air product to your listeners.

Today, transmitters in main or standby service range from 1940s tube vintage to solid-state, digitally modulated designs.

Proper care and maintenance go a long way toward delivering that quality signal.

Every facility planner should consider overall transmission efficiency: operating dollar spent vs. watt of signal delivered. Call it cash flow or watt flow; the result is the same.

□ □ □

Tom Osenowsky is a consulting engineer based in Brookfield, Conn. Reach him at (203) 775-3060.

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Maintenance Vital Budget Item

by Sue Jones

SPRINGFIELD, Va. In these days of superduopolies, mergers and LMAs, managers seek budget savings from the resulting economies of scale, often reducing duplicate staff positions and people. They assume that one employee can handle some tasks that occupied two in the past.

Managers can indeed reduce costs if they orchestrate change correctly. A duopoly may produce some savings, particularly if the stations are co-located. Stations can share expensive equipment such as copiers, computer networks, telephone systems and production studios. Two stations in the same building will require less space, reducing lease costs. Many savvy managers have already taken advantage of these improvements to the bottom line.

But the savings realized by combining facilities and staff can enthrall managers to the point that they lose sight of the importance of maintaining the high-tech plant that keeps them on the air. In a typical case, the manager of a new duopoly concludes that one engineer can handle both stations, and dismisses one of the two chief engineers. The manager reasons that broadcasting technology has advanced rapidly and that all-digital equipment requires less maintenance. This thinking could be penny-wise and pound-foolish.

Reactive, not proactive

Transmitters and other equipment are indeed more reliable today. However, they still require routine maintenance to ensure top performance, as a glance at other articles in this issue of *RW* reveals. Engineers usually perform routine maintenance when not handling remotes, emergencies or other duties. If an engineer must handle these duties for two or more stations, they could occupy 100 percent or more of the 40-hour work week. In this situation, the engineer has no alternative but to handle the most pressing jobs, and routine maintenance is the casualty. The engineer shifts into a reactive, rather than a proactive, mode of work.

The advance of technology does not eliminate the need for routine maintenance. The automobile analogy is useful. Certainly the technology in cars has advanced rapidly in recent years. Still, the owner knows that the car will suffer a premature death if it gets only gas. The car requires routine maintenance for optimal performance. If it doesn't receive it, it quickly wears out. Compare the relative cost of replacing a car with the potential losses that your station could incur because of improperly maintained equipment.

The savings on the bottom line from a reduced salary budget can add up to big expenses due to equipment failure. Some could far exceed the savings realized by reducing the engineering staff.

Some examples:

- Transmitters require routine cleaning to prevent components in the high-voltage area from arcing and burning. These problems will shut down the transmitter and put the station off the air. If the engineer has a spare component, replacement should take just a few minutes after the

engineer reaches the transmitter site. He or she must also spend several hours cleaning the transmitter to prevent the problem from recurring.

If the engineer must order a spare component, the station could be off the air for more than 24 hours until the part is shipped via expensive air freight. Total cost: 24 hours of lost advertising revenue, air freight, the cost of the component, and salaries of staff who could not do their jobs because the station was off the air. The engineer has also lost the time intended for other tasks before the transmitter failed.

"But we have backup auxiliary facilities for emergencies," the general manager

says. "We're unlikely to face this situation." However, the backup site needs routine maintenance as well. More than one station has discovered in its moment of need that the auxiliary transmitter was non-operational because of lack of maintenance and testing.

- As Tom Osenkowsky writes elsewhere in this issue, the air filters at the transmitter site are important. Check them monthly to confirm they are not blocked or need replacement; otherwise you risk not cooling the transmitter properly. Escalating air temperatures in the summer and the considerable heat generated by the equipment itself can cause it to

fail, thanks to a lack of cooled air. Inspection and cleaning take time.

- Many FM stations use transmission line pressurized with nitrogen gas. Line pressure must be maintained. Over time, the gas may bleed off. Without line pressure, moisture can enter, potentially causing the line to burn up and put the station off the air.

Something as simple as a routine cleaning job or replacing an empty tank of nitrogen gas could save the station thousands of dollars. This is a powerful case for maintenance.

A prudent manager should meet with the engineer routinely and discuss a maintenance schedule. The NAB engineering handbook and many transmitter manuals

continued on page 60 ▶

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Greenberg Discusses Issues of Day

► continued from page 1

tain minor changes in broadcast facilities without a CP." He is editing that one. To his left is the pile representing the blanketing interference rulemaking. That was his idea: to create a list of devices covered in the blanketing interference rules and review the whole issue.

Center front is a nine-inch pile of papers on the tower registration rulemaking. That was also a Greenberg idea.

Off to the right is an editorial criticizing the FCC for not protecting AM patterns from PCS and Cellular towers. Greenberg is working on that issue with Bill Ball in the Audio Services Division and Jay Jackson in the Wireless Bureau.

Try researching a technical topic that affects radio and, time after time, from AM/PCS debates to event broadcasting to digital audio broadcasting, someone will say, "Have you talked with Bob Greenberg about this?"

Field experience

During his last three years in college, Greenberg was chief engineer at WITR-FM in Henrietta, N.Y. The New York City native also did sound reinforcement for rock bands meeting the likes of Loudon Wainwright III ("Dead Skunk"), Charlie Daniels, Harry Chapin and Dickie Betts of the Allman Brothers.

He graduated from the Rochester Institute of Technology with his B.S.E.E. degree and 11 job offers. He chose the FCC because of his radio background and planned to stay if he liked it. Seventeen-and-a-half years later, Greenberg is busier than ever.

The Telecom Act increased his workload, but so did the two speeches he gave and two panels he sat on at NAB '96. Since then, Greenberg said he receives around 30 phone calls a day. His goal is to return them all within 24 hours.

"Having been on the outside and been the regulated, I know what it feels like and it's nice to get somebody the first time and get an answer and not get the run around."

Greenberg said he enjoys getting out to conventions, hearing what the FCC has done right and wrong, walking the floor, checking out what is new and "kicking the tires."

He travelled to San Francisco in July for the "maiden voyage" of the DAB field test van. He stressed that everything in the van worked as initially planned and praised the work of the engineers who planned and designed the van.

"From the little bit of testing I have seen, I would consider the field tests and all the tests a success. I think any time you do scientific testing to advance the art of broadcasting and science and get mean-

ingful results, I think you would consider that a success."

He admitted that the commission will eventually have to make some hard decisions. Right now, however, the FCC is waiting for the tests and reports to be completed.

As far as whether an L-band system could be adopted, Greenberg said, "I think there are still so many variables out there that everything is a possibility at this point." He stressed that this was his viewpoint and not necessarily that of the commission.

Regarding the politics, Greenberg said, "Anytime you have proponent manufacturers involving different systems which are competing to establish a service for what maybe the next 50 years, you will have disputes. However, I am not sure that's bad."

Two current issues are Greenberg's brainchildren: blanketing interference and tower registration. The rulemaking on blanketing interference is a result both of the encroaching of suburbs on radio stations and the proliferation in the last 10 years of so much computer and non-computer electronic equipment.

In his tenure, Greenberg said he has probably worked on all the "nasty" blanketing interference problems that have been brought to the FCC.

He pointed to another foot-high stack of paper (this one on top of his bookshelf. It contains filings and pleadings in a case in Rochester, N.Y., where over 100 homeowners complained of blanketing interference when a station moved its antenna into their neighborhood.

With all but five of the complaints solved, the station and homeowners deadlocked. Greenberg returned to his old stomping grounds as a peacemaker and problem solver.

"What I recommend in those really tough cases," he said, "is before you waste a lot of time, go to the local electronics store, cut a deal with them and ask them to borrow just about everything they have, take it out to the transmitter site and find out what works."

The research will save hours of time when someone complains their \$50 radio is not working right.

The new blanketing rule is intended to resolve questions regarding blanketing contours and it also creates a covered and non-covered device list.

"Right now, a lot of homeowners call in and say, 'I'm getting interference on my telephone,' but that is not a covered device." Greenberg wants everyone to know what is a covered device and what is not.

Greenberg is clearly proud of the work he and other staff members have done to improve the tower registration process. It was his idea to simplify the process for registering all towers rather than have each individual bureau require different information from their licensees.

He put together one of the first cross bureau teams which coordinated with the Federal Aviation Administration to come up with a simple tower registration plan.

The ultimate goal is the creation of a universal tower registration database that industry, the government and the public will be able to access.

"The database has the potential to tell you who owns the tower and who most

of the licensees on the tower are by tower number," said Greenberg. He also expects it will save redundant filings for the industry and save processing time and money for the FCC.

The current registration process is the culmination of four years of work and meetings. After hearing from broadcasters with tower registration windows in July, August and September that they were having trouble getting surveyors and consultants, Greenberg encouraged the moving of those windows to October.

"My objective is to get the most accu-



Robert D. Greenberg

rate information into our database and if it's going to take another 30, 60 or 90 days to get the accurate information, I thought that was important and so did all the other bureaus."

Prevent disruptions

Greenberg is also interested in addressing rules that will prevent the PCS and cellular towers from disturbing AM array patterns. He is talking with the Wireless Bureau, but the Telecom Act has slowed progress.

"What we would like to see done is an NPRM dealing with protecting AM arrays by all other towers (not just PCS and cellular) but all towers that go up. What we would like to do is create the rule and put it in part one so everybody knows this is an established service, they were here first and if you build a tower near an AM array, you have to protect them."

He encouraged any stations with major problems from PCS or cellular towers to write to the chief of the Wireless Bureau. He added that a copy should also be sent to Bill Ball or himself so the Audio Services Division can document the problem. AM owners ready to move to the expanded band will be pleased to hear that Greenberg listed the AM expanded band as one of the top three technical issues in the Mass Media Bureau right now.

Greenberg understands broadcasters are concerned about the shrinking FCC. In the last year, Greenberg reported, the Mass Media Bureau staff has been reduced 19 percent.

In the last 18 months, the Audio Services Division staff has lost 10 engineers and four analysts.

But the Audio Services Division and Mass Media Bureau have been able to do more with less, processing almost as many assignments and transfers in the first three quarters of 1996 (2,316) as it did in all of 1995.

"I have to say it's a group effort and we have a really good team," said Greenberg.

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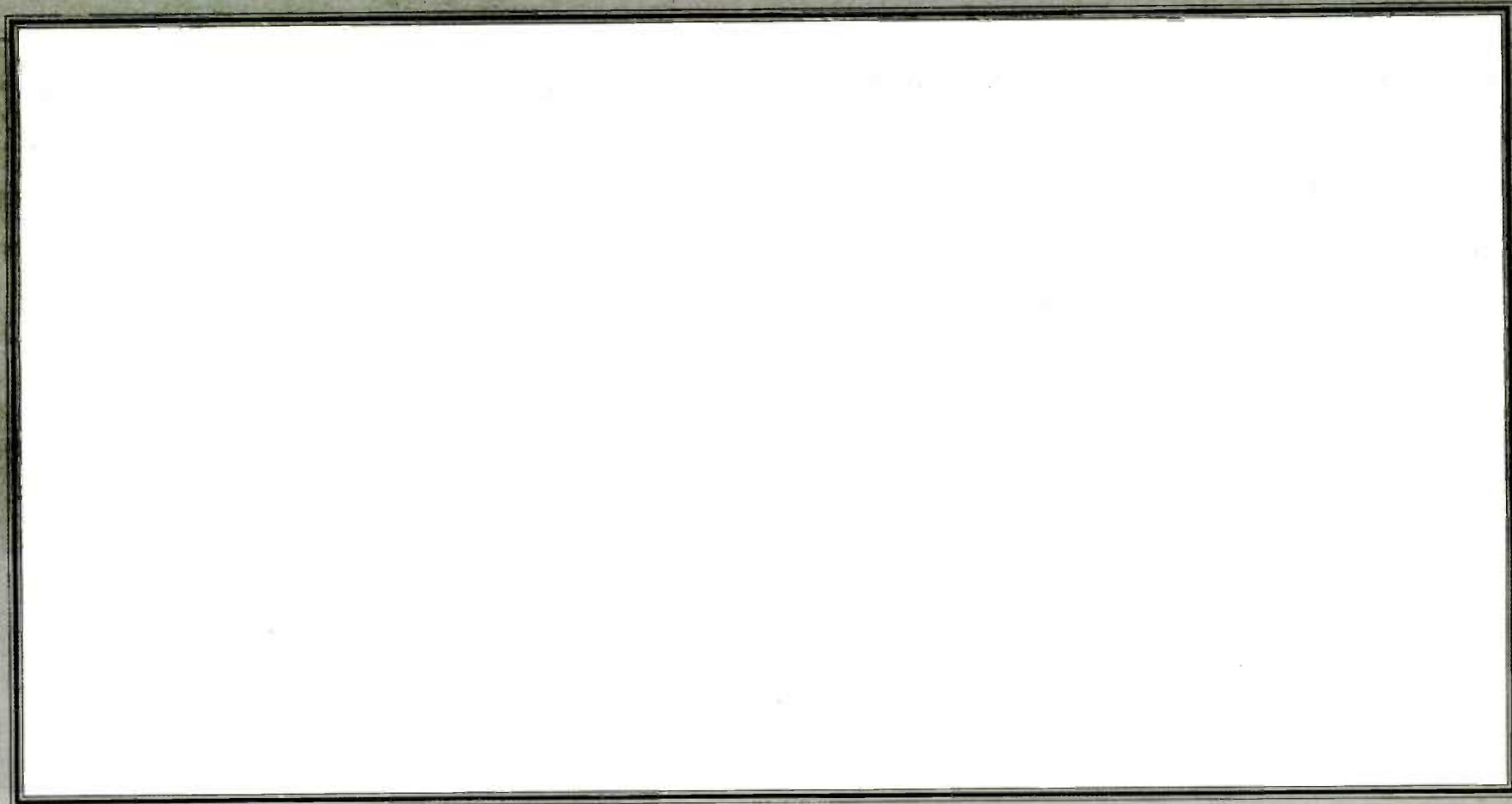
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PRODUCT EVALUATION

Ultramaximize Your Digital Audio

by Read G. Burgan

LAKE LINDEN, Mich. Ah, the uneasy necessity of limiting. If only I knew of the K.S. Waves Ltd., L1-Ultramaximizer long before this.

Once during a coffee break at the Michigan Technological University Memorial Union building, John strode over to our table. John was a professor in the electrical engineering department and a loyal public broadcasting supporter. I was the director of the Tech public radio station.

"I can't listen to WGGJ in my truck!" he exclaimed.

At 100 kW, I knew it could not be our signal strength. Because Houghton, Mich., is at the bottom of a valley, we had our share of multipath but no more so than any other area broadcaster.

A broad smile broke out as he watched me ponder his statement. "Your dynamic range is so great that the noise in my truck makes it impossible to listen without turning the sound so high the crescendos deafen me," he laughed.

John was right. While commercial stations in our area pumped up their modulation, we proudly maintained as much of

the original dynamic range as possible. This also meant stations with less power sounded louder than we did in portions of our coverage area.

In stereo, the outer edge of our coverage area was often marginal. During the '70s, we dropped our stereo subcarrier during mono programs like "All Things Considered" in an effort to boost our signal in those areas.

Purists have argued for decades over various forms of limiting to a broadcast signal. Manufacturers have made equipment to boost perceived station output by maximizing modulation through various forms of limiting. There probably is not a single station that does not use some form of limiting in an effort to stand out in the crowd.

The result can be hardly noticeable, ugly sounding (to all but management) or a trademark audio "signature" to be proud of. Like it or not, limiting is a part of broadcasting.

Now it is possible to digitally apply limiting to program material and production before you broadcast it. K.S. Waves Ltd., has produced a software plug-in for the Sound Forge that applies sophisticated

peak limiting to any WAV soundfile. Other features will improve soundfiles that are converted to shallower bit modes.

K.S. Waves specializes in signal processing and user interfaces for the professional audio and multimedia markets.

Waves began in 1988 with offices in Tel Aviv, Israel, and Knoxville, Tenn. An early

it to how many you can use without adversely affecting performance.

However, you might have to position your computer a few feet from the wall to accommodate all those dongles.

Once the HASP key is on your computer, install the software.

Using the L1-Ultramaximizer as a peak limiter is simplicity itself. There are only two slider controls to adjust. First select a small sample portion of your soundfile with a click and a drag. You only need a second or two of material.

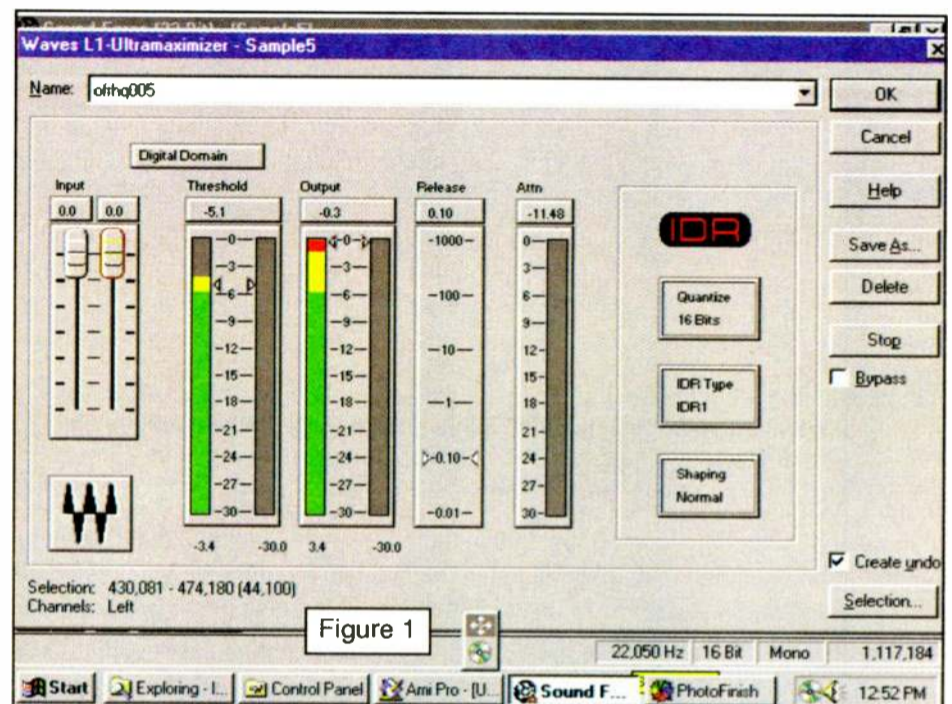


Figure 1

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product was the Q10 Paragraphic EQ for the Digidesign workstation. The company has continued to develop digital audio plug-ins for both the PC and the Mac.

Peak limiting often creates distortion or a signal so compressed that it calls attention to itself. Many analog peak limiters are unable to deal with the wide variety of peaks. They allow some to slip beyond the set level or introduce distortion in an attempt to suppress an unusually strong peak.

The L1-Ultramaximizer applies peak limiting in a way that rigidly maintains the signal at precisely the level you select.

According to the designers, "The L1-Ultramaximizer avoids the possibility of overshoot by utilizing a look-ahead technique that allows the system to anticipate and reshape signal peaks in a way that produces the bare minimum of audible artifacts." And it works, too.

The L1-Ultramaximizer requires the Windows 95 version of Sound Forge and will not work on the regular Windows 3.x platform. It comes on a 3.5-inch floppy and includes an HASP key, which you may know as a "dongle," a hardware copy-protection device with a pair of 25-pin connectors.

Insert the HASP key into the parallel (LPT1) port before installing the software. If you use a printer or other device, disconnect the printer, install the dongle, then plug your printer into it. Should another software package require its own HASP key to run, simply stack them one after another. There is no theoretical lim-

Select the Process Menu and the L1-Ultramaximizer submenu to see a screen display similar to Figure 1. For most limiting applications, you need only concern yourself with Threshold and Output.

The Output slider sets the maximum level of the audio signal. While you can set it for the maximum, the manual suggests setting it about 0.3 dB less than maximum.

The Threshold slider sets the point at which the peak limiter is applied to the signal. If left at maximum, the software will function like a regular Normalize processor: evaluating the waveform and increasing overall level so the peaks are at the maximum level specified.

Virtually all digital audio software provides a Normalize function for good reason. Unlike analog recording where signal peaks can wander above 0 dB, digital recording will distort badly if you pass 0 dB by even a fraction.

Good recording practice requires staying comfortably below the maximum level. The same practice demands that you later normalize the signal to maximize your signal-to-noise ratio in the system.

The problem with normalizing a signal is that many peaks actually contain little energy. Raising the peaks to 0 dB leaves most of the musical energy well below maximum level.

To increase peak limiting, lower the threshold level. The manual suggests 4 to 6 dB lower. Click on the Preview button to hear the effect of the threshold slider

continued on page 34 ▶

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Software Compressor

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and see it graphically displayed on the Attenuation bar graph. The Preview function will continually loop your selected sample so you will hear the effect of the Threshold slider as you move it up or down.

The Threshold slider determines how much of the sound wave will be affected by the peak limiter. Only that portion of the sound wave that is above the threshold setting will be affected. So if you set the threshold at -6 dB, the software will raise those portions of the soundfile that are between the peak and 6 dB below that to peak level.

It is important to pick more than one sample of the sound wave to check the effect. After applying it a few times, you will probably find a setting to save and apply to all similar types of program material.

When you are satisfied with the amount of peak limiting, simply click on OK. If you do not like the final result, you can undo it as fast as it was applied. On my Pentium 100, the process takes about 70 seconds for a three-minute 22 kHz file.

The L1-Ultramaximizer also has a button for switching between digital and analog domains. The manual recommends leaving it in the digital mode for most applications. For times when you encounter peak overshoot due to a poorly designed D/A converter, or you plan to broadcast the signal without further limiting, the analog domain mode will brick-wall limit, ensuring no sample ever exceeds the set ceiling.

Figure 2 shows a portion of a soundfile before applying the L1-Ultramaximizer. Figure 3 shows the same file with approximately 6 dB of peak limiting. You can see that the file is now significantly higher in overall volume.

That's all there is to it. As simple as it is to apply, the effect is great. I found that the L1-Ultramaximizer enables me to significantly increase the loudness of a soundfile without adversely affecting dynamic range.

Used on a spot or promo, it will increase impact. Used on music cuts, it will reduce the amount of compression needed from your hardware limiter.

In the end, most radio broadcasters want the same thing: A signal that is stronger than their competitors but that is clean and without artificial companding and compression. The Ultramaximizer can help you do that.

Requantize?

The Ultramaximizer also allows requantization of your soundfiles with greater resolution.

Quantizing refers to the number of bits you choose to use in working with a file. For high-quality recording, most digital audio software programs use 16 bits, while some high-quality programs use 20 or 24. As a rule, most CD and DAT recorders are limited to 16-bit resolution.

The L1-Ultramaximizer allows you to work in whatever bit resolution you prefer, then save it to another lesser bit resolution. By applying specially designed dither algorithms, this results in only a minimal increase in noise.

You would use this function if you record a file at 24 bits and have to save to a conventional CD or DAT in 16-bit form. When producing multimedia CDs or Web pages with sound, you will likely

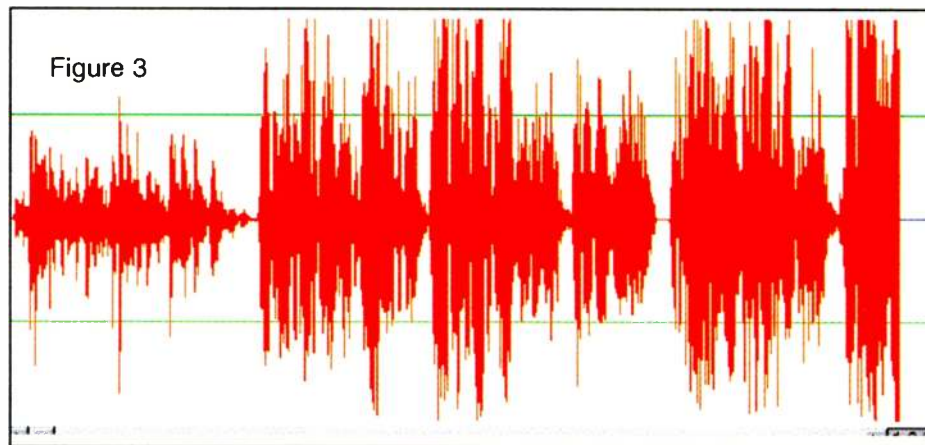
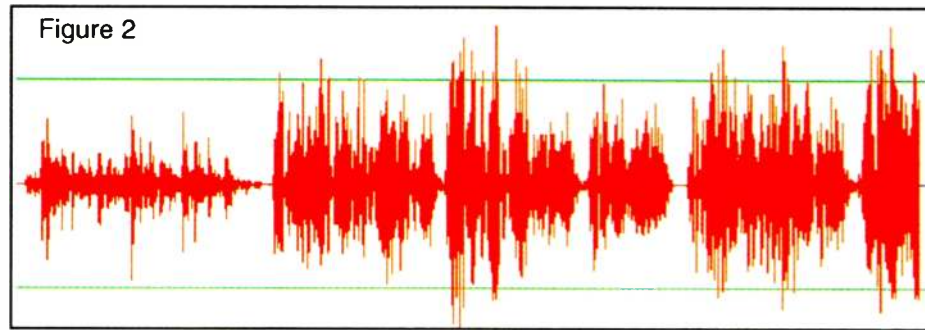
reduce the resulting files to 8 bits, 11 or 22 kHz sample rate.

There are three buttons that affect the

the file. The resulting file will then be 8 bits with the corresponding decrease in file size.

A file processed by the L1-Ultramaximizer is not a true 8-bit file until — and unless — you select that option when you save the file.

When you requantize a soundfile to a



Increased Digital Resolution (IDR) function: Quantize, IDR Type and Shaping. Quantize determines the resolution at which the file will be processed: 8-, 12-, 16-, or 20-bit.

Math lesson

Note that even though the quantize setting might be 8 bits, it will still be a 16-bit file when the processing is done. All the L1-Ultramaximizer does is set the lower 8 bits of your file to zero. It will sound like 8 bits but will still be a 16-bit file. If you save the file as is, it will take up just as much space.

But you can create a true 8-bit file by selecting that option when you go to save

lower resolution, you invariably increase the noise of the sound file. The lower the resolution, the higher the overall noise level. On loud passages the sound will mask most of the noise, but it will be apparent on quiet passages.

The other two options, IDR Type and Shaping, provide you with a means of minimizing this noise through dither and shaping applied to the soundfile.

The IDR button provides you with three choices: None, Type 1 and Type 2. Type 1 is described as the purist's choice, adding little or no distortion to the low-level portions of the signal. The Shaping button provides you with four options: None, Moderate, Normal and Ultra.

When both options act on a sound wave, they do not reduce the noise per se, but reshape it and move it to a portion of the audio spectrum that makes it less apparent and less noticeable to the human ear.

The software is designed to provide the greatest effect with 48 kHz 16-bit soundfiles, but can improve soundfiles at other resolutions. The preview function is extremely helpful in determining which settings to apply to a particular file. You can quickly try all combinations and decide which one is best.

Because the noise introduced by lowering the resolution of a soundfile is essentially low level, a higher level of peak limiting can mask more of the resultant noise. I applied the IDR functions to both 48 and 22 kHz files, and found that it improves the quality of lower-resolution soundfiles.

Waves has an extremely well-written manual that walks you through all the functions of the L1-Ultramaximizer and gives an in-depth background on the theory and issues affecting peak limiting and quantization. The Web site contains even more information on using the L1-Ultramaximizer and other Waves products.

The L1-Ultramaximizer is produced by K.S.Waves as a plug-in for the Sonic Foundry Sound Forge. It requires Windows 95 and has a list price of \$595, but Sonic Foundry has been offering it at an introductory price of \$450.

As far as I am concerned, this is an excellent product that moves Sound Forge into world-class digital audio standing.

If you plan on mastering CDs or just want to give your sponsors the hottest spot around, Waves L1-Ultramaximizer will give you an edge up on your competition. That is, until they get their own copy.

□ □ □

K.S. Waves is at 4302 Papermill Road, Knoxville, TN 37909. Telephone (423) 588-9307 or e-mail waves@waves.com

Read Burgan is a free-lance writer and a former public radio station manager. He can be reached at (906) 296-0652 or through e-mail at rgb@up.net

A LOOK BACK

Hard Disk Recording, 1940's Style

WASHINGTON The ideal remote audio production system today is portable, field-editable and can transfer between storage media formats within one unit. It will surprise you to know a similar machine was available nearly 50 years ago, and could record either to tape or "hard disc."

Of course, the discs in question were not digital, but hard wax or lacquer phonograph records. But let us not get picky.

During the late '40s, the Wilcox-Gay Corp. of Charlotte, Mich., manufactured the Recordio IC10.

This was a unique device that was part tape recorder and part disc cutter. Originally intended for music students, it was equally functional for home use or by touring pro musicians.

Where disc recorders of the day could only cut audio directly to disc, The Recordio allowed recording to tape first, then a transfer to a 10-inch, 78 rpm

record blank. The company promoted the fact tape could be erased and reused, but it was also possible to make and edit a tape recording first before committing it to wax, all inside one machine.



Sound familiar? Compare it to today's technology where a WAV file can be recorded and edited inside a computer, then transferred to CD-R.

Advertising copy for the Wilcox-Gay Recordio hyped the device as having

"full-range, hi-fidelity reproduction," although it most likely topped off at 5 to 7 kHz at best.

To compare, the professional "broadcast-quality" RCA 73-B disc lathe had 10 kHz response.

The copy went on to boast a full hour of recording time on one slow-moving five-inch reel, the Recordio's use as a phonograph or PA system and the ability to record from mic or telephone.

The icing on the cake was its transportability. The 27-pound unit could be taken anywhere.

Portability and the capability to field-edit a performance are paramount issues today with current PC-based audio recorders, just as they were when the Recordio came along 50 years prior. Our present has seemingly caught up with our past.

— Alan R. Peterson

If you have information about the Wilcox-Gay Corp. or any similar combined devices, write us here at RW.

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- (51) button front panel programming
- Remote control is only a chassis with terminal strip (you supply buttons, lights, and automation)
- No interface to station automation.

SAGE ENDEC MODEL 1822

- 6 standard audio inputs
- (6) RS-232 digital inputs/outputs standard
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- Commercial tally allows interface with program automation for alert playback around program schedule

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PRODUCT GUIDE

Companies with new product announcements for Studio Sessions Product Guide should send them to:
Radio World, c/o Studio Sessions Editor, P.O. Box 1214, Falls Church, VA 22041

Carver PX Series Amplifiers

Carver Professional introduced the PX Series of high-quality sound amplifiers.

The PX1450, PX850 and PX450 amplifiers deliver high power into four ohm loads and can deliver stable two ohm performance due to power supply efficiency and thermal capacity. Neutrik combi-connectors accept quarter-inch or XLR input connectors.

These models are also available with barrier strip I/Os, and are cataloged with a BR suffix in the model number.

Signal Smart Standby Circuitry powers down the amplifier when no signal is



PX Series High-quality Amplifier

present, extending life and saving energy. Response of the PX Series is 20 Hz to 20 kHz with 65 dB channel separation. Highest power is available from the PX1450, which can output 950W per channel into a two ohm load.

Carver will ship the PX Series amplifiers starting in September.

For information, contact Carver Professional at (503) 978-3344 or circle Reader Service 4.

Promusic Jingle Machine

Promusic introduces Jingle Machine, a CD of production elements available as a buyout for \$99.

The CD contains 214 jingles, stings, logos, IDs and spoken phrases with and without music or sound effects. A detailed booklet of cues and index points make the disc extremely easy to use.

Elements can be used as is, or layered on a DAW or multitrack for creating tags

or segues.

For information, contact Promusic at (407) 995-0331 or circle Reader Service 2.

Return of SAW Classic

Innovative Quality Software (IQS) is re-releasing the original Software Audio Workshop (SAW) under the name "SAW Classic."

The original \$599 hard disk editing software program returns at a breakthrough \$299 price, making it ideal for first-time users.

SAW Classic can run on older, less-expensive computer systems. Minimum system requirements are a 386/40 CPU with 8MB RAM, 16-bit soundcard and VGA monitor. Four stereo tracks of real-time playback are available.

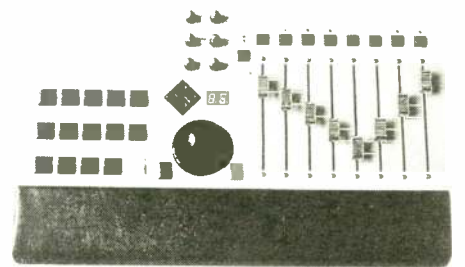
SAW Classic can sync to SMPTE with a Music Quest MIDI/SMPTE card, perform equalization and compression, and it supports file format conversion. The software runs under Windows 3.1.

For more information, contact IQS at (702) 435-9077 or circle Reader Service 37.

Audiomation DAW Controller

Audiomation Systems has the Audio Station digital controller for Mac-based audio workstations.

The console includes eight assignable motorized faders with Mute keys, six assignable rotary controls and 12 program function keys. A series of transport



Audio Station digital controller

control keys and a shuttle/scroll wheel allow remote control of the DAW right from the surface of the unit.

A variety of different interface protocols allow operation of differently configured DAWs.

The Audio Station includes MIDI, GPI and ADB interfaces. Because all controls can transmit MIDI data, each one is assignable to perform any function.

Audiomation will be releasing a PC version of the Audio Station in the near future.

For more information, contact Audiomation Systems at (508) 881-7808 or circle Reader Service 64.

Yamaha Mixing Console

New from Yamaha is the MX400 audio mixing console.

The four-bus mixer features five auxiliary sends, flexible signal routing and switchable balanced inputs on all mono channels. Every mono input features three-band EQ, an 80 Hz high-pass filter, a TRS insert point and direct out. Phantom power and switchable 20 dB pad are also included.

The console is available in 8-, 12-, 16- and 24-input configurations; shown is the MX400-24 version.

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FIELD IMPRESSION

New dbx 262 Limiter: They Lovett

by Tom Vernon

PHILADELPHIA Much of the equipment that comes through the "World Cafe" studios for evaluation in *RW* is economy-mode gear. I keep thinking sooner or later we will get a lemon. But not this time.

Our newest arrival, the dbx 262 Compressor/Limiter put a smile on the faces of our producers. From a cost perspective, the 262 is attractive because it has a street price of just under \$200.

Specifications are impressive, too. Response runs from under 3 Hz to 110 kHz, +0/-3 dB. THD+noise is around

0.01 percent at +4 dBu, and IMD weighs in at less than 0.2 percent SMPTE. Dynamic range is better than 114 dB.

Like its more expensive ancestors — the 160, 161, and 162 — the 262 uses true RMS



The dbx 262 Limiter

level detection that allows for more natural control than peak or average detectors.

RMS power summing is used when the two channels of this box are stereo-

coupled, again resulting in a less constricted sound. The 262 is housed in a sleek black box, one rack unit high weighing 3.6 pounds.

Inputs and outputs are made by quarter-inch TRS plugs, balanced or unbalanced. Each channel has an eight-segment LED bar graph to indicate gain reduction, as well as a three-segment LED display. This lets you know if you are below or above the compression threshold, or operating in the OverEasy mode.

Knobs to twirl include one to set the threshold, one to determine compression ratio, and finally, an adjustment for out-

put gain.

Front-panel switches include bypass switches for each channel, as well as controls to switch between "Hard Knee" and OverEasy compression mode.

A peek under the top cover of the 262 reveals how dbx can sell these units for such a low price and remain in business.

Fabrication techniques are reminiscent of consumer-grade gear.

Sheet metalwork and overall assembly, although competent, is by no means elegant. Circuitry for the 262 is on two PC boards, one for the power supply, the other for everything else. ICs are soldered directly to the board.

Front-panel controls and switches are all PC mount. All pots appear to be consumer-grade.

Because the pots route DC control voltages and not audio, you may not even need to clean the pots.

Component designations are silk-screened on the boards.

Documentation is also economy-driven. What you get with these units is a 13-page operators manual.

Its lighthearted and humorous style will allow novices to install and operate the 262 without difficulty.

But pity the poor person (you?) who has to fix one of these boxes. No service information is included.

In all fairness to dbx, at just under \$200, these units border on being throwaway technology if they fail.

I know what you are really waiting to hear is how these units behave in the field. And the answer is, quite well thank you.

Celebrity test

Shortly after the 262 was installed, Lyle Lovett was our guest on the "World Cafe." The dbx 262 was put through its paces.

Our producers noticed the crisp, clean sound of the 262, even while the compression was pushed quite hard.

This noticeable lack of compression artifacts differentiated the dbx from the older compressor/limiters that we normally use.

Another thing that made producers Chris and Joe happy was the feel of the controls. The knobs are rubberized, and the pots are all detented, making it easy to get a grip and know where you are without having to look; two important factors in the middle of a frenzied recording session.

Displays are bright and easy to see from any viewing angle, even with intense lighting. And of course, the legendary OverEasy function produced a smooth sound.

My guess is that the 262 will hold up well in the studio, but taking one of these units on an extended road trip might make me nervous.

The transformerless inputs are vulnerable to all sorts of accidents, and field service seems difficult. With the price of this box being so low, it might be advisable to pack a backup unit, just in case.

My guess is that the folks at dbx built this box with a conscious trade-off in mind: serviceability vs. a mix of sound matching many of their classic units. To that end they have succeeded.

Special thanks always to producers Chris Williams and Joe Taylor of the "World Cafe" who torture-tested the dbx and shared their results with me.

□ □ □

For information, contact dbx at (801) 566-8800 or circle Reader Service 63.

Tom Vernon divides his time between consulting and completion of a Ph.D. You can e-mail Tom at tlvernon@aol.com

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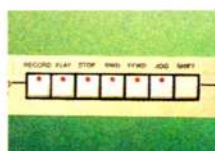
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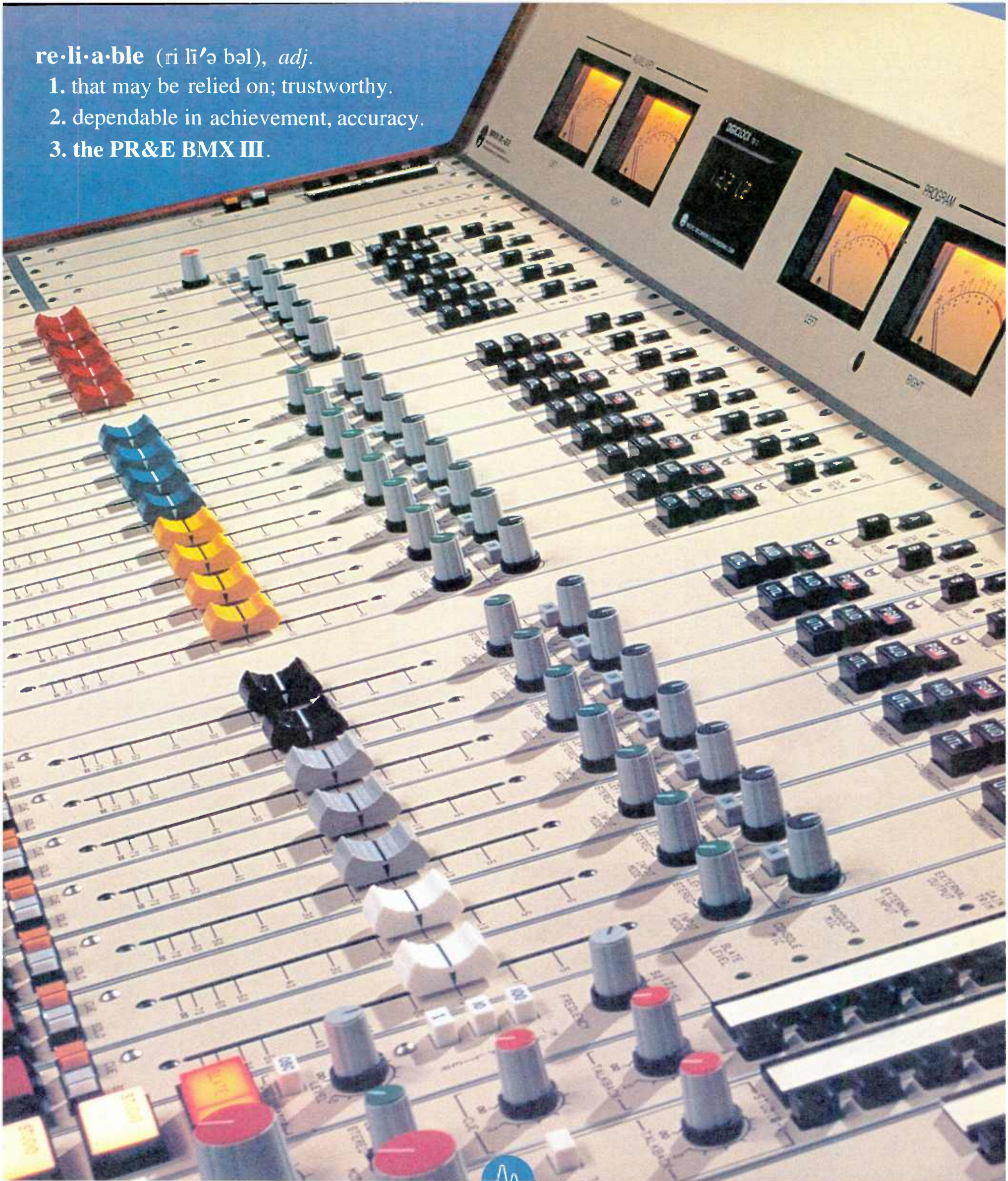
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PRODUCT EVALUATION

Making Tracks with StudioFrame

by Alan R. Peterson

WASHINGTON Computer Concepts Corp. is among the earliest companies to create reliable high-quality hard drive commercial storage and playback systems; in this case, the DCS. This device is found in hundreds of stations from coast to coast and beyond.

Computer Concepts recently hobnobbed with the folks at TimeLine Vista (makers of the TimeLine DAW-80) and released the Studioframe digital audio workstation; A radio-specific device based on Timeline movie and TV audio editors, intended to compete with high-end workstations such as the Orban DSE-7000.

Computer Concepts lent an eight-track unit with two IGB drives to *Studio Sessions* for 30 days to give it a run for its money. Our findings: The system is enormously powerful and versatile, but expensive.

The big box

Studioframe comes in five parts: the CPU, 17-inch monitor, PC keyboard, a huge trackball and the optional DSC-100 controller. An eight-line snake connects the Studioframe to an analog eight-bus console, and digital signals are easily sent and received via coaxial connectors.

The Studioframe Pentium-based single-board CPU and hard drive is contained in a heavy steel rackmount case with a locking front. Rather than a flimsy mini-tower PC, the case is almost military-spec in its heft and construction.

This also tends to run rather expensive. I consulted the Industrial Computer Source catalog (telephone (800) 523-2320) to note comparable prices of single board Pentiums (around \$2,299) and steel cases starting at \$750 and up. A lot of money is going into cabinetry.

The monitor, keyboard, mouse and controller all connect to the rear of the CPU. The front remains locked away from the

probing fingers of DJs.

A "dongle" or electronic security key needed to run the system also plugs into a special port on the rear of the CPU. When the DSC-100 controller is used, an extra pigtail cable is also needed.

The radio version is configured for eight tracks. Additional audio cards and SCSI drives will expand to 24 tracks and perhaps beyond. Call Computer Concepts for details on expansion.

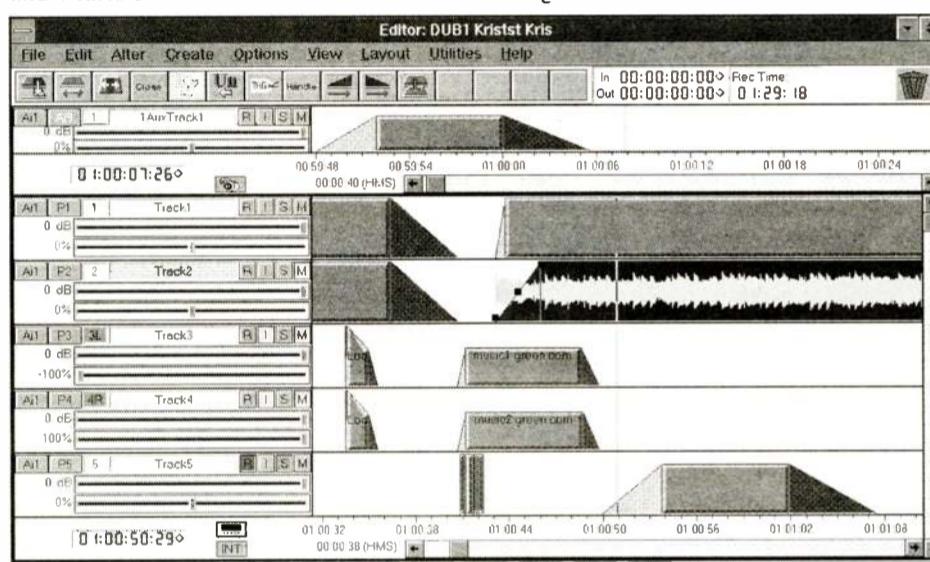
Splurge

If you get the Studioframe, spring for the controller and a Reel. These could be "Mona's Pizza" and "Weekend Special 2," respectively. If the Mona project already exists, the software looks to see if the Reel also exists.

These steps keep recordkeeping straight and help locate a project rapidly when the client calls for those inevitable changes.

This is a solid, well-built box. Transport and Mark/Unmark buttons on the con-

controller are built to take some thumping. The weighted happy-wheel scrubs audio very nicely, and legends on the keys are screened to stay on for years.



StudioFrame Track Window

I noticed the wheel on my DSC-100 was a little misaligned and scraped

against the Lexan surface when spun. I chalk this up to life on the road; I got the unit that goes out on demo calls.

If you opt not to get the controller, the Studioframe keyboard is a great help. Rather than sweat out cryptic Alt-Shift-F3-Space commands, just follow the key-caps; many are imprinted with the functions they execute on Studioframe.

The Studioframe screen provides you with everything you need to know.

First up, you will be prompted to select a Project and a Reel. These could be "Mona's Pizza" and "Weekend Special 2," respectively. If the Mona project already exists, the software looks to see if the Reel also exists.

Studioframe prompts you to define a Layout that, among other items, allows you to set track numbers to go top-to-bottom or vice-versa, and if you wish tracks to move to the left or the right. Ever wish the DAW you bought had an Aux bus? Studioframe has, and you select its use here.

When you are ready, move to the Track Window where you view the tracks and make your edit decisions. The Track Window looks busy but is easy to get around. This is the place where you will be spending all your time, so get familiar with it. The Audio Control area has the track status buttons, volume and pan sliders, as well as the track name and number. Grouping tracks for stereo L/R recording is also done here. Track Display is where the action is. You can display soundfiles as lines, event envelopes (blocks with tapered ends) or as waveforms. Studioframe has a tough time with multiple waveform displays and takes a long time to draw out all eight tracks. Single-track redraw happens much quicker. Some lesser-priced DAWs record only one event at a time, forcing you to assemble a project piece by piece. You get what you pay for. But Studioframe's multiple inputs allow simultaneous recording of many tracks at once like an analog multitrack. This means cutting a voice part on Track 1 while simultaneously adding a CD stereo music bed on Tracks 2 and 3. Another CD machine can be laying sound effects down onto Tracks 4 and 5, while Tracks 6 and 7 can be taking a wet

Product Capsule:

Computer Concepts Studioframe

Thumbs Up	Thumbs Down
<ul style="list-style-type: none"> ✓ Fast and powerful ✓ Dedicated controller ✓ Crossfades within track ✓ PC-based for upgrades 	<ul style="list-style-type: none"> ✓ Price and warranty ✓ No optional mixer

For more information contact Computer Concepts at (913) 541-0900 or circle **Reader Service 36**

return feed from the reverb (all at the same time).

Editing is done with the controller, a mouse or with the keyboard Mark Bar (spacebar). Rectangle stretching with a mouse isolates the portion you desire to be edited, while the controller's happy-wheel moves the desired audio under the playhead cursor.

Ultraprecise editing can be done under a numerical Event Editor window, where exact time location points are entered by keyboard. Ignore that feature and let the TV and movie people have it. Your client wants to hear his spot in 10 minutes.

You can draw fades and levels right on the event envelopes with the mouse or trackball. Start/stop ramps, edit points and splice lengths are all displayed here. Crossfades between two separate events on the same track are even possible. Creative use of this feature almost feels like 16 tracks.

According to Computer Concepts' Stuart McRae, "mousing" a mix is easier than using faders. A mixer takes up physical space, fader components can go bad and performing more than one level of Undo on an automated mix is impossible with a fader-style DAW.

On the other hand, engineers and production rats alike voice the desire to feel real faders under their fingers for real-time mix decisions and tweaks. Because Studioframe can read MIDI data for mix decisions, I think the company should offer a fader/mixer controller or provide compatibility with existing hardware controllers from J.L. Cooper, Penny & Giles and others.

Automated control over the mix is done in the Track Window, although mix decisions are not saved here when the project is closed. For more automated mixing options and MIDI details, read the StudioCAD feature coming up.

The TimeFit feature squeezes or stretches audio segments to fit a desired time limitation. Time companding range is from 50 to 150 percent, although experience shows 95 to 110 percent corrective companding is the norm for most radio production.

Mark the interval requiring time companding, place the playhead cursor and select TimeFit from the Alter menu. You will be prompted to select several parameters preserving transient and rhythmic detail and the actual compression ratio.

These parameters allow you to preserve more of the rhythmic definition (say if music were the source material) or transient definition to retain clarity of speech. This kind of control should be available on all time compression methods.

An Audition button allows you to hear the effect before committing to it, while an Abort button lets you stop the process if desired.

continued on page 43 ►

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LINE OUT

Hum Clinic: Stop RFI Noise in Mic Lines

by **Bruce Bartlett**
with **Jenny Bartlett**

Part III

ELKHART, Ind. Welcome back to our hum clinic. This month we look into microphone hum, RFI interference, and connecting multiple sound systems.

Microphones are very sensitive to hum fields because mics require a lot of gain. Here are some tips you can use to minimize hum picked up by your mics:

- Route mic cables at least one foot from power cords and AC extension cords. If mic cables and power cables must cross, do so at right angles and separate them vertically to reduce coupling. Refer them to the diagram in RW, July 24, page 19.
- Use a balanced cable from the mic to the input. If your recorder or mixer takes an unbalanced phone plug, the shield and pin 3 go to sleeve; the pin 2 lead goes to tip.
- If the mic cable still picks up hum, unbalance the cable through a transformer that is plugged directly into the input.
- If hum pickup is severe with dynamic mics, use dynamic mics with humbucking coils built in.
- To reduce pickup of magnetically induced hum, use a mic cable with twisted-pair conductors.
- To block electrostatic hum, use shielded cable and ground the shield. Braided shield generally offers the best shielding. Double-spiral wrap is next best, and spiral-wrapped is worst.
- Routinely check your mic cables to make sure the shield is soldered to pin 1 at both ends.
- Check that the mic connector setscrew is securely screwed clockwise into the mic handle. This setscrew is in the handle near the connector.
- For outdoor work, tape over cracks between connectors to keep out dust and rain.

Reducing RFI

You can control RFI by many of the techniques that prevent hum. RFI is heard as clicks, radio programs, buzzes, or "hash" in the audio signal. It is caused by CB transmitters, computers, lightning, radar, radio and TV transmitters, industrial machines, auto ignitions, stage lighting, and other sources.

To reduce RFI:

- Install high-quality RFI filters in the AC power outlets.
- Use enclosed equipment racks.
- Avoid long ground leads and unbalanced lines that are over 10 feet long.
- Some mics have unbalanced high-Z cables that feed into a balancing, low-Z power module. These high-Z cables can pick up radio and TV signals. If so, cut the unbalanced cable short and solder the power module close to the mic.
- For long connections to ground, use wide copper straps or braids, rather than wires. This reduces the high ground resistance caused by skin effect; the tendency of RF signals to travel on the

outside of a conductor.

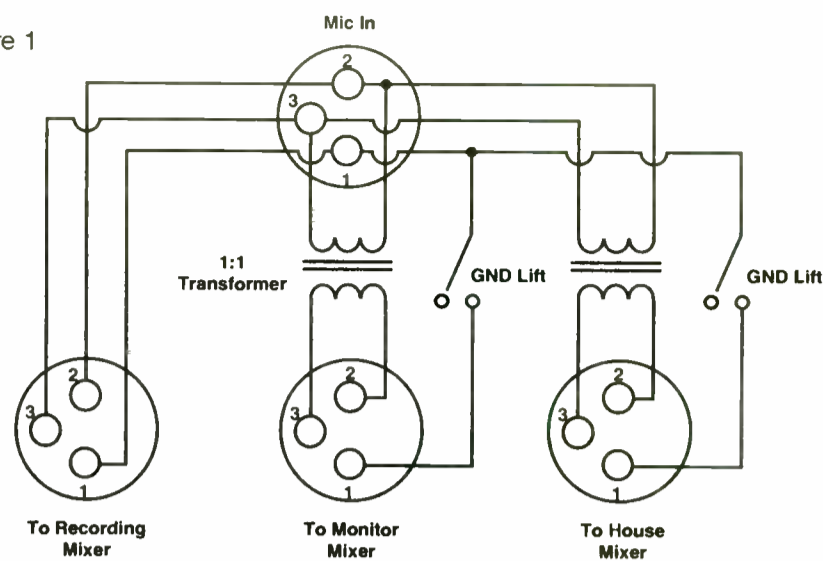
If your mixer has unbalanced mic inputs, connect a 250 to 1000 pF capacitor between the hot terminal and ground.

Is the shell of the mic input connector grounded to chassis? If not, solder a 0.001 μF Mylar capacitor between the shell terminal and the mixer chassis.

Long speaker cables can act as an RF antenna, but you can shunt the RF to ground at the power amp speaker terminal

continued on page 45 ▶

Figure 1



AM Power Module

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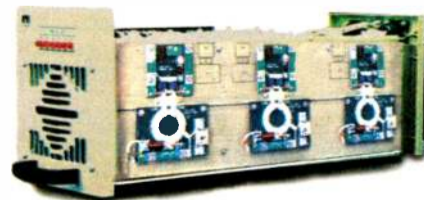
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The EAS 911

PRODUCT EVALUATION

Crown CM-700 Mic: This Is No Flashlight

by Rich Rarey

WASHINGTON "It's a MagLight!" cried a colleague. "Nah, Crown CM-700 microphone," I said, holding the mic out for inspection. "What's it do?" the colleague asked.

"According to the spec sheet, everything" I said.

The Crown CM-700 is a slim, cardioid condenser microphone that is a good, low-cost performer for music and vocals. At a list price of \$239, it seems a natural choice for semipro and pro applications, and would be a useful tool in any recordist's mic kit. And yes, it does slightly resemble a popular machined metal flashlight.

Sound selection

The CM-700 has three roll-off modes: Flat, Low-cut, and Roll-off. According to the frequency response chart, Low-cut is down 3 dB at around 100 Hz; recommended by Crown to remove HVAC rumble and reduce breath pops.

The Roll-off setting is down 3 dB at about 150 Hz; suitable, Crown says, for lectern or close miking. And using the CM-700 in "flat" will give a smooth response down to about 50 Hz for all things bass: drum, or deep, or acoustic.

Included with the CM-700 are a swivel mount and two types of windscreens: the WS-12 foam pop filter reduces vocal plosives, and the WS-11 foam windscreen reduces wind noise outdoors.

The quick feature tour completed, we set out to evaluate the CM-700 in several likely uses: as an instrument mic, as a vocal mic, and as an announce mic.

Although the last category is not specifically listed in the the Crown suggested uses

Some radio stations use the CM-700 for commercial voice work.

menu, J. Mark Chapman, Crown microphone application tech rep, says some radio stations are using it for commercial voice work in the production studio.

Because the CM-700 reminded us of a Neumann KM84 in size and pattern, we chose to compare the two, realizing that the KM84 costs much more.

Sing us a song ...

For a quick vocal check, we mounted the two-stage pop filter on the CM-700 and set it on a stand. A second mic stand held a KM84 a few millimeters below the CM-700. A PopperStopper screen was placed between the mics and a mezzo-soprano of our acquaintance.

We asked our singer to try two styles: breathy and melodic. Plosives were a definite problem on both mics. The mic elements of each would flail in the air of the first "p."

Both mics were pleasing on vocals, reminding one of the stage-usefulness of the CM-700, but needing much, much more plosive protection.

Spoken word was faithful, too. Any male voice that works the CM-700

closely will certainly benefit from the low-cut setting; proximity effect is more pronounced in the CM-700 than a KM84.

It stands up well in front of loud voices, but I think it might not be suitable for screamers.

... You're the piano man

For music, the studio was set up thusly: the CM-700 was placed midway between a 1923 Steinway B piano body and full-open lid. The KM84 was again mounted a few millimeters below the CM-700. Cables ran to a SonoSax Mic preamp model SX-M2 that also provided phantom power, and then into a Sony-10 Pro.

The CM-700 went on the left channel, the KM84 on the right. Gain was matched on the SonoSax mic pre, the CM-700 output being slightly lower than the KM84. The CM-700 was set to "flat" response.

Although the Crown application notes suggested a mic placement directly over

the piano sounding board, it was not practical to remove the piano lid to do this; we settled for the lid open on the tallest stick.

We listened to the playback in a control room later, and the result of the piano comparison was surprising. The CM-700 closely matched the KM84, except that the CM-700 had a brighter tone, almost sharper on some piano notes above middle C.

Some chords sounded ever-so-slightly "glisteny" or "ringy" from the brightness. The differences, though, required careful comparison to detect. Both mics had a pleasing response on chords below middle C. We found that the CM-700 designed frequency response

is brighter above 6 kHz, accounting for our results. The specifications cite a 3 percent THD at 151 dB with 48V phantom power. Crown recommends using the Roll-off setting and placing the mic eight inches away, and below one's mouth, aimed at

the chin.

The CM-700 is best used as a fixed-position microphone. It is not designed for handheld use, and would require a zeppelin or other serious shock mounting to be freely used outside.

Crown publishes application notes for its microphones, and makes them available for the asking. Chapman says the application notes for the CM-700 are to be published soon, and recommends referring to the CM-200A notes until that time.

The application notes are a must-have for those new to recording and for those wanting to get sensible advice on using Crown microphones.

Illustrations provided in the application notes show typical stage and studio pickup schemes, and specific instrument miking techniques.

The Crown CM-700 is a small, low-cost microphone that delivers good performance and as an added benefit, says Chapman, a CM-700 will indeed fit into a MagLight belt pouch.

□□□

For information on the CM-700 mic, contact Crown International at (219) 294-8000 or circle Reader Service 35.

Rich Rarey is technical director for National Public Radio's "All Things Considered" and author of RW's "Public Domain" series. He can be reached at rrarey@npr.org



Crown CM-700 Condenser Mic

StudioFrame Digital Workstation

► continued from page 40

CAD it get any better?

Yes it can. The StudioCAD mixer included with StudioFrame is a 10x4 virtual mixer that generates MIDI controller messages. Mix decisions are made by grabbing a control icon and "spinning" it with the mouse.

Because it is a MIDI controller and not a hardwired mixer, StudioCAD can be customized and configured to behave any way you wish. Enter the CAD mode and create your own knobs, dials, and the like, to perform whatever MIDI function you require.

I never had the chance to evaluate the StudioCAD MIDI automation functions. The eight-pin DIN connector on the DSC-100 controller was complicated beyond my desire

to experiment, although the manual suggests Mac II and Silicon Graphics serial connectors are of the correct configuration for MIDI. Standard five-pin MIDI jacks on the CPU would have made me a happy man.

Many production people will route those eight audio lines to an analog console, bypassing the StudioCAD mixer. Nevertheless, the feature is available and offers fine control over pan position, channel phase, level and parametric EQ.

Conclusions

StudioFrame is feature-packed and easy to use, once the learning curve smooths over. The controller is a huge help, so I recommend getting it. Engineers are busy working on a jock-friendly "thin" version of the operations manual; the original version is nearly two inches thick.

I think this is a great product, but the \$16,400 price tag struck me as steep, and I felt the warranty could be improved.

StudioFrame is priced to compete with high-end DAWs like



Computer Concepts StudioFrame

the Orban and presumably the ADX from PR&E. However, it lacks the integrated hands-on mixer found on both. Again, a compatible MIDI mixer can change that overnight.

The StudioFrame's obvious advantage is upgradability; a better system is only a floppy or CD-ROM away. Computer Concepts provides radio upgrades free for a year (TimeLine offers software updates to movie and TV production users for a fee).

Revisions are in the air even now, with the slow waveform redraw issue being addressed first.

The Computer Concepts warranty is for 90 days, parts and labor; parts only for one year and subsequent support fees of \$30 per month. By contrast, Orban guarantees the entire DSE-7000 for a year. Similarly, many computer dealers warrant their products for up to two years. I would prefer to see StudioFrame equally supported.

Contact Computer Concepts in Lenexa, Kan., to arrange for a demo of the StudioFrame workstation. This is a product you have to see and touch rather than view in a brochure.

Shop Now for Your Christmas Reel

by Alan R. Peterson

WASHINGTON Some months back I mentioned that I found salvation and therapy in creating "Christmas Reel" spots about difficult clients I did not care for.

I believe I said "You already know what those are," but over time I have found out this is not as well-understood a term as I thought.

I never asked whether this was due to people's work being consistently excellent and never requiring correction, or they were just too busy or shy to put together a fake spot.

In any case, these poor people have never experienced the sweet essence of redemption and cosmic purification found only in the creation of a really ripping Christmas Reel spot. To these deprived souls I devote this ARP.

Defining a CR

What I call Christmas Reel spots — or CRs for short — are so named because we would collect them onto one reel and play them back at the station Christmas party. They are variously called Goodie Reels, Blooper Reels or The (Expletive) Reel, owing to the salty language.

Most often, these are simply outtakes and warm-ups culled from production workreels people forgot to bulk, or undeleted bits left behind in the DAW. Howlingly funny, but technically not the same.

A true CR is a coarse, completely fake commercial produced for the sole purpose of blowing off steam.

Steve Williams is currently the program director for WPLM, Plymouth, Mass. While we were both at WMAS(AM), Springfield, Mass., he was in charge of assembling the station Christmas collection of bogus spots and bad words. From one year to the next, they were consistent dissemblers.

"The Weasel Reel" has been circulating for years in central New York, reportedly credited to former production man Bruce Seigel. This collection featured raunchy takeoffs of the Fotomat elves, broadcast

schools, bus companies and a realistic-sounding commercial for a sports beverage obtained from weasels. Don't ask.

Obviously, every market has its own legendary reel in circulation, filled with bogus commercials that were produced by somebody who — with or without malicious intent — clearly felt the need to cleanse his or her soul.

The anatomy of a CR

Scientifically analyzing what makes a CR funny actually makes it unfunny very quickly. The true litmus test is when a newcomer is herded into the production room by a senior staffer and told, "You have got to hear this spot done by a guy who used to work here."

There are no hard-and-fast rules on what makes a CR great, but the basics are a good place to start. May you be inspired to build upon them and take the art of bogus therapeutic commercial production to a new zenith.

• *Safety first:* Never store a CR on the station hard drive. No matter how many safeguards are built into the system, Murphy's Law guarantees it will air during the Sunday worship broadcast.

If you save it to a cart, mark it profusely with red "Do Not Air" labels and keep it in your locker away from the main studio. Best bet: Save it to a reel or a personal DAT.

Similarly, never let a client hear a CR. These people pay your salary and will pull their money out of your station in a heartbeat. Remember, a CR is your secret voodoo doll. Treat it as such.

• *It must sound legit:* A CR has the same

attention to production detail as genuine spots — Effects, music choices, acting, everything. If it parodies an actual spot, telegraph the fact it is fake, but only a little. For the most part, play it straight until you get to:

• *The payoff:* This is the loaded cigar that makes the spot funny. How much impact you produce into it is proportional to the grief the particular client has put you through during the year.

Avoid real violence. Cartoony approaches

with huge sound effects are acceptable and very fulfilling. Remember, make it sound legit while keeping it cartoony. The client's own jingle helps.

Unexpected behavior contrasting one's persona delivers a huge payoff. "Friendly" neighborhood

car dealers that finally flip out and beat customers into pulp. "Painless" dentists that switch to garage air wrenches and industrial pile drivers. The nightclub that sponsors "broken glass on the dance floor" night.

Raunchiness is entirely too easy to do. Wally the Windowshade King dating a moose is no challenge to the truly devilish production mind. You can be much more creative.

• *Things to watch out for:* Given the looseness of actual broadcasts, vulgar language is passé. Icky words are only funny on outtake reels — like the Kasem "Snuckles" cut that has been circulating for several years.

Ribald events, however, are very different. Placing unsavory people into

uncharacteristic situations can prove very satisfying. Suspending Barbecue Bob over one of his own hickory firepits while being seasoned with his own sauce can be quite gratifying.

Verbal attacks based on race, gender or serious health issues are not funny and absolutely will get you fired. Don't even think it.

Similarly, untrue and unsubstantiated statements could be libelous and slanderous and may get you sued. Harry's Used Cars just might get a hold of your tape, so vent your steam in a more inventive way.

• *On the other hand:* You never know what will happen if the "wrong" person hears your CR spot.

The owner of an appliance store in one particular market was a well-known pain to most production people there. I was fed up with this clown after one uniquely difficult session so I cut my own version of his radio commercial.

You should have been there. This spot had it all. Rude language, exaggerated sound effects and a completely implausible plot involving him in a loose adaptation of "Jack and the Beanstalk."

To my horror, the station salesperson who handled the account played it for him as a goof. But rather than pull all his business off our station, he laughed out loud, played it again and told us to clean it up to use as a real ad. Go figure.

Always a favorite

CRs — or whatever you may call them — continue to be a favorite project of production directors. Maybe there is no time to recut that carpet commercial, but by cracky, there is always time to produce a really good CR!

Nothing would make me happier than someone gathering up CRs from different markets and creating a compact disc filled with these gems. If anyone intends to, I would be honored to send you my favorites and write the liner notes. I'll even buy the first CD hot off the shrink-wrap machine.

Just don't ask me to cut the commercial for it. After the fourth revision, you may find yourself hoist by your own petard and the recipient of a CR with your name on it!



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Eliminating Hum

► continued from page 41

nals. Connect a 0.01 to 0.03 µF, 100V disk capacitor between one speaker lead and the amplifier chassis ground. Use one capacitor per channel.

Suppose you have a line-level cable with a floating shield, and it is picking up RFI. Connect the floating shield to pin 1 through a 0.01 µF capacitor. This bypasses the RFI to ground without connecting the audio signal to ground.

Are you getting RF through a balanced mic input? Filter out the RF at the mixer's mic input connectors. Solder a 0.01 µF capacitor between pins 1 and 2, and between pins 1 and 3. You might also put a ferrite bead on each lead going to pins 2 and 3.

Multiple sound systems

When doing a remote, you are outside the controlled environment of the studio. So you need to be careful to avoid ground loops when you connect several sound systems together.

One of the most complex remotes is a live concert. When a concert is recorded, up to four separate sound systems may be used: house PA, stage monitors, recording, and broadcast.

These four systems share the mic signals by taking transformer-isolated, balanced feeds from a mic splitter, shown in Figure 1.

To avoid ground loops between the systems, ground the cable shields to only one mixer. At the splitter, use the ground-

lift switches to disconnect the shields going to the other mixers. Ground to the mixer that provides the least hum.

You might need to power all the mixers from outlets near the grounding mixer. That way, all the mixers share a common ground. Only the grounding mixer should supply phantom power to the mics.

Sometimes a radio station takes an audio feed from the recording or PA console. In this case, you can prevent a hum problem by using a console with transformer-isolated inputs and outputs.

Or you can use a 1:1 audio isolation transformer between the console and each feed.

Such a transformer comes in handy when you connect balanced to unbalanced equipment. Mount the transformer in a rack near the patch panel.

Suppose you connect two sound systems with a balanced line-level cable between them, and you hear hum. The cause might be a ground loop. This can occur if pin 1 is tied to the shield on both ends of the cable.

Prevent the loop by attaching a cable ground-lift adapter shown in Figure 2. It floats (removes) the shield at one end, breaking the loop. The shield still works because it is grounded at one end of the cable.

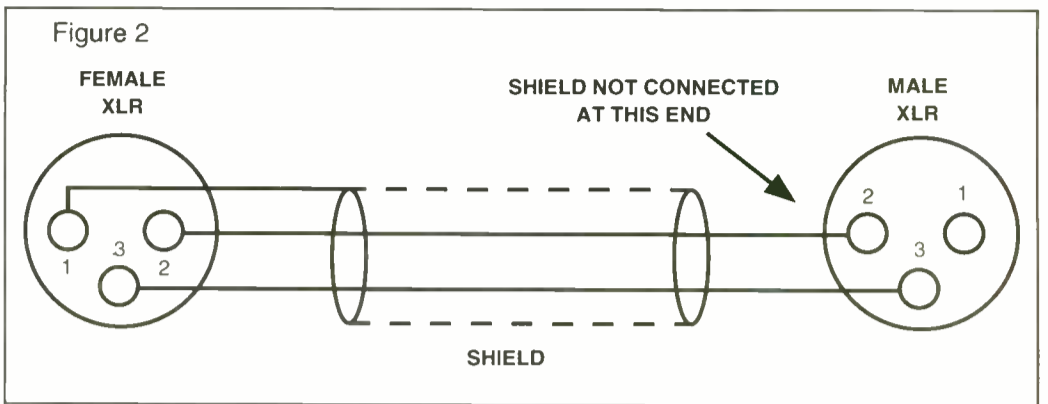
If a mic stage box is grounded to its

cable shield, and the box contacts a grounded metallic surface, this can cause a ground loop. So do not ground stage boxes.

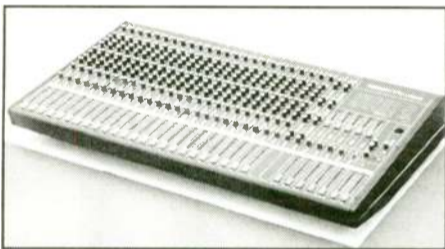
More on hum prevention next time.

□ □ □

Bruce Bartlett is a mic engineer, writer and recording engineer, 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.



PRODUCT GUIDE



► continued from page 36

For information, contact Yamaha at (714) 522-9011 or circle Reader Service 27.

Sonic Solutions New Release

Sonic Solutions is shipping Version 5.0 of SonicStudio, adding new features and enhancements targeted to CD mastering and radio broadcast production.

SonicStudio enables up to four independent recordings and can be made simultaneously and can play back audio at double-speed, enabling editors to quickly work through long stretches of recorded material.

A new instant trigger feature allows final edit lists to go directly to air from any SonicStudio workstation on the network.

Version 5.0 also allows generation of CD disc images, making it possible to create multiple CD-R reference discs at much greater than real-time speeds.

The new version of SonicStudio began shipping June 28. All current registered users of SonicStudio will receive the upgrade free of charge.

For information, contact Sonic Solutions at (415) 893-8000 or circle Reader Service 28.

Spike and Glide Music

Network Music is shipping the "Spike and Glide" collection of production music and elements. The collection, which debuted at the Las Vegas NAB show, consists of three separate collections for a total of 12 CDs.

"Spike" is described as a hard-edged, belligerent collection of stingers, punctuators and hits with a heavy-metal mood. A series of sustain pads underscore promo copy.

There are more than 300 cuts available on four CDs.

"Glide" is an adult contemporary collection of unobtrusive hits and copy-point emphaziers.

Jazz Turns and Animators are piano/sax arrangements for punctuating copy points. There are also 300 cuts available on four CDs.

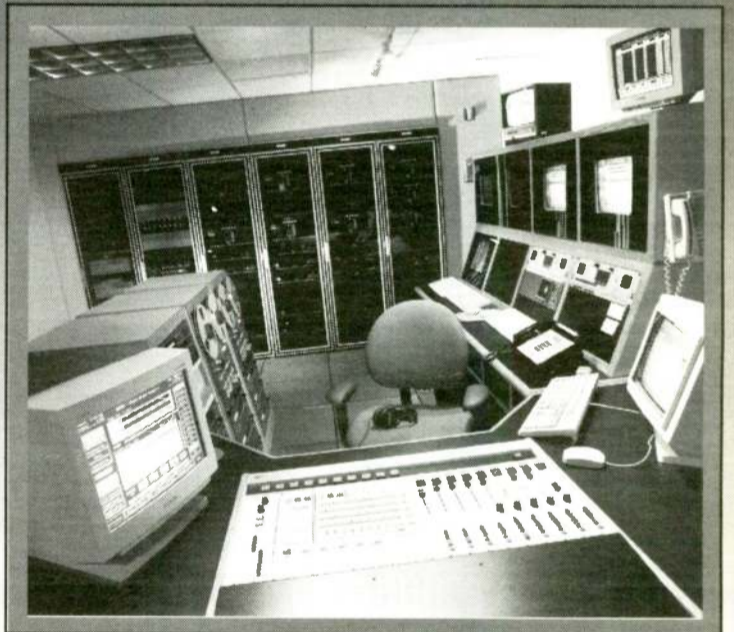
The "Spike and Glide Comedy Pack" offers 340 humorous cuts with comedy sound effects, drum rolls and rimshots, rubber ducks, clown effects, Vox drops and human noises.

A series of 100 electronically processed phrases are included, ideal for customizing any kind of radio promo announcement.

For information and a demo CD, contact Network Music at (800) 854-2075 or circle Reader Service 29.

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The Master Control Studio, shown right, is one of seven Arrakis studios in Sony's Manhattan network origination center for SW Networks.



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Manager's Notebook:

Seek Experts for Facility Planning
See page 53.

'Your Motherboard Warned You!'

by Alan Haber

ALEXANDRIA, Va. Hard rock, cows and horses. That's what's been goin' on up here at the ever-hip, ever-hoppin' global Haberspace headquarters. Before they start mixin' it up (the rock, cows and horses, I mean), I'd better get to it.

Neat-O Site of the Month

Rock and roll!!!!!! Welcome the fine folks at HardRadio to Haberspace. At HardRadio (<http://www.hardradio.com>), hard rock is the name of the game. 24 commercial-free hours a day.

Straight outta Dallas and spouting crunching riffs from Anthrax, Metallica, Def Leppard, Judas Priest and Mötley Crüe (among other bands) via the literally just-moments-ago-released StreamWorks 2.02 player (more on this next month), HardRadio seems to be, at least for now, the last word on hard rock on the Net.

The atmosphere at HardRadio's site is very dark right from the get-go. Every page has a black background — fitting, I would say, for this kind of music. On the homepage, you're greeted: "Your



[Http://www.globalwebs.com/bbhorse/](http://www.globalwebs.com/bbhorse/) is the place to be for all things horse.

Internet last New Year's Eve. Head cruncher Tracy Barnes (he's also the engineer and the HTML guy) used to program the Z-Rock national satellite network and was also a jock there. Barnes said he saw hard rock as "a big, huge, underserved national and international niche."

On June 10, HardRadio teamed with Apple Computer to bring the audio and video of a Metallica concert to the Internet's hard rockin' surfers. The

station has done five global premieres of key band albums, including ones by Great White and Kiss.

Currently jock-less except for some prerecorded programs, HardRadio targets males age 25-35. It focuses on current and '80s hard rock (no underground thrash) and is reaching a large audience — how's in the neighborhood of 1.25 million hits and about 200,000 visitors a month sound?

E-mail is coming in fast and furious from HardRadio listeners: Barnes said between 39 and 47 percent each week are from the United States; the rest are from around the globe, including Australia, the United Kingdom, Germany and Japan.

A good time is to be had by all who venture into HardRadio's hard rockin' world, even those for whom hard rock isn't a preferred cup of tea.

Bang your head there soon, Neat-O Site of the Month, don't you know.

Mooooove it on over

As I've said before in this column, I like to see a healthy sense of humor injected into a radio station Web site. Well, here's a funny one for ya: KMOO.

Yup, the KMOO Web site is a good place to shmoooooze (groan), even if KMOO isn't a "real" radio station. That's right, KMOO, "The Rock Cow," is on line at <http://www.demsoft.com/kmoo/index.htm> for the sole pur-



pose of showing stations how to make their Web sites shine.

Steven Dahlman of DCM Software Solutions is the wrangler who put together the KMOO digs, a demonstration site that shows radio stations what his company can do in the way of Website development. Check out Dahlman's creation. I think you'll like what you find.

And what will you find? A nicely designed sample site that will make you



smile, and attract listeners to boot. You're greeted with KMOO's logo and the oppor-

continued on page 49 ►



Motherboard Warned You About Us." Fair warning to those who enter HardRadio's hallowed halls!

HardRadio started rocking out on the

PIONEER PROFILE

Remembering Kay Kyser, Radio's Elusive Star

by Richard W. O'Donnell

PORT RICHEY, Fla. One minute he was Kay Kyser, the celebrated "Old Professor" of show business. Everybody knew him. The next, he was gone.

It was as though he had evaporated or never existed. Kyser spent the last three decades of his remarkable life away from the spotlight, doing other productive and rewarding work.

Kay Kyser was a big-time star. He was a band leader and a smash hit when his "Kollege of Musical Knowledge" went on the air in 1938. He was also the first band leader who became a major star in the movies, and he brought his entire band with him. Later, he was a television favorite.

Then in the early 1950s, he suddenly announced his retirement. He was only in his 40s. Though he had succeeded in the big band era, Kyser yearned to live out his life in his native North Carolina. After that, he rarely attracted media attention until his death in 1985 in Chapel Hill.

N.C., at age 79.

James King Kern Kyser was born on June 18, 1906. He had so many "Ks" in his name that friends started calling him Kay, and the nickname stuck.

Natural leader

When he was only 20 and attending the University of North Carolina, he formed his own band. This was quite an achievement. Kyser did not play a musical instrument, nor would he ever. He succeeded because he was a natural leader and ran a happy band.

For almost a decade, "Kay Kyser and His Orchestra" survived by playing at college functions. In the mid-'30s, the group moved up to performing at major hotels, and for four years it did radio remotes.

Big success came in 1938, when Kyser came up with a radio show called "The Kollege of Musical Knowledge." It was a fun quiz show on which contestants from the studio audience tried to win prizes by

continued on page 57 ►

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EQ by Orban. With a simple keystroke you get the flexibility to create, correct and shape sound. Notch out unwanted sounds. Even choose from a variety of broadcast-related EQ presets including everything from a telephone patch to a padded cell. That should put an end to those side effects once and for all.

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Horses and HardRadio

► continued from page 46

tunity to win a trip to Wisconsin (there is no actual trip, by the way).

Next, you see a picture of KMOO's mascot, The Rock Cow, followed by a welcome message, which says the "station" plays "the Top Five songs just the way you like 'em!"

Four pages describe the mythical KMOO: Moosic News & Station Stampedes, a funny day by day listing; Multiple (Air) Personalities, complete with fake bios (KMOO's mid-day guy, Floyd — actually Dahlman — plays "the Top One song" well, and nothing else for his entire four-hour shift!); Win Trip to Wisconsin ("Man, I wish I had the budget to send people to Wisconsin," says Dahlman, "and bring 'em back!"); and Listen to Us (just click on the cow to hear what's happening at KMOO).

Dahlman, who spent 15 years in radio, has a solid demo site here. He says he's been milking cows for comedy ever since he can remember. "The cows and me," he notes, "we've crossed many prairies together." Hoof it on over to <http://www.dcmsoft.com/kmoo/index.htm> and cross a cyber-prairie or two yourself.

Neighm that tune

This seems to be a month for the off-beat here at the global Haberspace headquarters. I came upon a Web site for a show called "Bit and Bridle — Hoofbeats on the Air," which has aired on KSPA(AM)-KOWF(FM) in Escondido, Calif., for the last three months on Sunday evenings at 8.

Jean Carter's equine "Talk Show" is in the spotlight at this nice looking Web site which is saddled up at <http://www.globalwebs.com/bbhorse/>. For all things horse, this looks like the place to be.

OK, let's recap. So far this month, we've looked at hard rock, cows and horses. Whatever could be next? How about a look back at what I consider to be

the best listing of radio stations on the Web?

Good idea, if I do say so myself! The MIT List of Radio Stations

The atmosphere at HardRadio's site is very dark right from the get-go. Every page has a black background — fitting, I would say, for this kind of music.

on the Internet, located at <http://wmbr.mit.edu/stations>, is getting bigger and better all the time. If you've been thinking that radio on the Internet is just a passing fad (and shame on you

if you have), think again. As of July 29, there were 1,149 FM and 323 AM U.S. stations linked from here. Stations broadcasting on the Web are marked with a yellow lightning bolt for easy picking.

In addition to U.S. stations (which can be sorted by "K" and "W"), this list

serves up links to 127 stations in Canada, 35 in Australia and 267 in Europe.

It also provides links for various international stations and networks around the world.

An easy-as-pie on-line form is provided so your station can sign up.

Hats off to Theodric Young, who has been tending this list since its inception, and continues to do a great job.

Well, that's about all the space we have this month. I mean, me.

That's all the space I have. You don't have any space. It's my space. That's why they call it Haberspace.

So, because there's no more space left, we'll have to get prepped next month instead (if you read last month's column, we were supposed to get prepped this month ... So it goes).

Keep me up to date on your station's cyber-activities. I'm at zoogang@earthlink.net. Cows, horses and hard rocks are especially welcome.

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ROOTS OF RADIO

Early Manufacturers Still Active

by Ronald Pesha

QUEENSBURY, N.Y. Cunningham and Sovereign vacuum tubes? Remler variable capacitors? Jewell Electrical Instrument Company multimeters?

These companies advertised their electronics in the February 1928 issue of *Radio Broadcast*, a periodical targeted at home receiver builders by the Doubleday book company. Yet the advertisements in the magazine include familiar, and in some cases still active, corporations.

According to the Centralab ad, audio-taper potentiometers for volume control purposes were new. Battery operated receiver design often specified variable resistances in plate or even filament circuits of radio frequency stages for gain control.

Touting taper control

For AC-powered receivers, Centralab touted its tapered control, resistance not stated but presumably high, in a grid circuit.

For high voltage control, Centralab showed its wirewound potentiometer in values from 2 kilohms to 50 kilohms, priced at \$2. The ad mentions a "new improved positive voltage control for B-eliminators, insuring better tone." The ad does not state how varying the B+ affects the tone.

Clarostat also offered a 500-kilohm volume control pot for \$1.50 including knob and binding posts. Judging from the drawing, its "one-hole mounting" appears identical to today's three-eighths-inch nut-secured design. Some parts standardized early.

The Allen-Bradley Co., manufacturers of "Ohmite" resistances, offered a variety of controls with standard mounting, plus those binding posts (actually screw heads, as found on terminal strips), but with an external, oval shape.

Hammarlund-Roberts Inc. purchased two ads in the February 1928 issue. A two-thirds page display offered a 25-cent booklet with full directions and parts list for building the "Hi-Q Six" receiver for an outlay of \$98.50.

"Save at least \$100," the text promises. However, the elegant cabinet in the photo shows no evidence of a speaker, typically sold separately in those days.

The Hammarlund Manufacturing Company offered parts including a variable ball bearing tuning "condenser." (The word "capacitor" eventually replaced "condenser" after World War II.) Old-time hams remember Hammarlund for its extensive line of capacitors, parts and complete receivers.

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"I thought radio was a plaything. But now my eyes are opened and I'm making over \$100 a week," one ad states. This hook leads the reader into a full-page ad for the National Radio Institute, J. E. Smith, president. His school would survive the Depression and operate for decades.

Another ad shows the parts you can buy to "build 12 different circuits," and depicts the Peerless Signagraph for code

instruction. A large crank projects from its wooden case. Apparently a spring propelled the paper tape, punched with dots and dashes. This home study course was "conducted by the Radio Corporation of America."

Another familiar name is Belden. In its 1928 advertisement, Belden Wire suggested its flexible "Indoor Aerial Wire" to "sharpen the tuning of any radio receiver." Of course, the indoor wire simply delivered a weaker signal than was usually provided by long, high outdoor antennas considered necessary in those days.

The General Radio Co., Cambridge, Mass., offered a line of variable tuning

capacitors and also a "B-eliminator," a high-voltage power supply operating from the household lighting AC. Dry batteries and their frequent replacements were expensive, and AC-operated power supplies were "in."

The General Radio unit included a wirewound resistor to adjust for any voltage up to 180, and included a 50 V low-current negative supply for biasing Class B audio output tubes.

Other familiar names from 1928 include the Weston Electrical Instrument Corp., which showed the long-familiar, round, black cased meters. Thordarson Electric offered massive iron-core inductors in the

form of transformers and chokes.

What of Shure? You'll find it here, but without a word about transducers — no mention of microphones or phono pick-ups, only a free catalog of parts, kits and "Supplies of National Fame." Receivers sold for \$100 and up, B-eliminators were \$55, tubes \$5.

That was a lot of money in 1928, when a typical annual income was under \$2,000. If I had been reading that magazine in 1928, I would have sent for a lot of free catalogs, and dreamed.

Come to think of it, that's what I do today.

□ □ □

Ronald Pesha is Associate Professor of Broadcasting at Adirondack Community College, Queensbury, New York. Reach him at (518) 743-2200, ext. 567, or by fax at (518) 745-1433.

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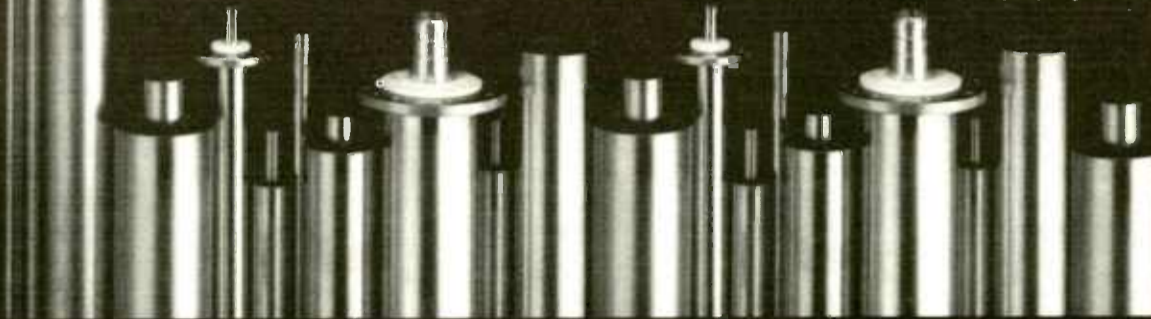


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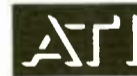
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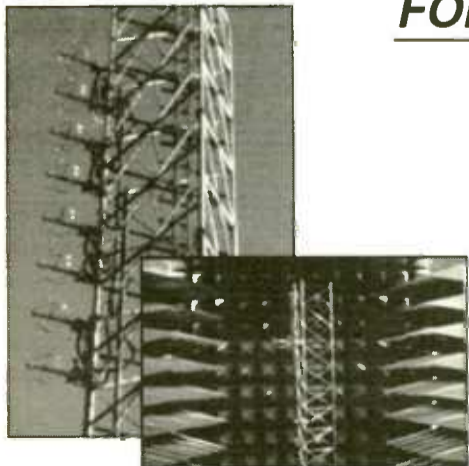
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MANAGER'S NOTEBOOK

Use Experts for Facility Planning

by Sue Jones

SPRINGFIELD, Va. The time for planning next year's budget and major activities is here. Among your biggest headaches and budget items are your studio facilities. If the lease expires next year, you may wish to consider relocation. Perhaps your equipment needs upgrading. Maybe you have outgrown your facility. The money saved by relocating to smaller, less costly space could help recoup the cost of badly needed equipment upgrades.

When faced with the need to renovate or relocate, seek professional advice. Ask your FCC communications attorney about relocating and the possible impact on your license. When you are ready to renovate or relocate, seek the advice of managers who have completed similar work. They can provide insights that will save you time and money.

One station that has just completed a major space renovation and facilities move is WPFW-FM, a Pacifica Public Network station in Washington.

Helpful tips

Lou Hankins, interim general manager, found that two pieces of advice helped make their project successful.

"Break all conventional ideas on what type of space is appropriate for a radio station," he said. Also, "Use architectural and engineering firms that understand exactly what you do. We obtained the services of Bowie-Gridley Architects of Washington, and Multiphase Broadcast Engineers in northern Virginia to design and build the new station."

The new facility is a renovated old warehouse built out specifically for their broadcasting needs. It accommodates volunteers, tapes and a wide selection of music and guests.

The operations manager at WPFW, Bob Daughtry, also served as the project manager. He said that before the move, the studios were in a building that suffered from older electrical, telephone and air conditioning systems that were different on each floor and constantly in need of repair. Daughtry said the old facility was also inefficient because it had not been

modified appropriately for a broadcast facility. The station staff worked on three separate floors, slowing communication between departments.

The planners found that the large open spaces of an old warehouse, outfitted with modular furniture designs, could accommodate the entire staff. Station operating costs have dropped because the infrastructure and broadcast equipment are new or upgraded, reducing repair and operational problems. The station sound and consistency have improved considerably, stretching its reach and "listenability." Time, money and energy spent in the past on repairs now go toward programming, special events, fundraising and smoother operations.

A project of this magnitude has many facets, explained Daughtry. The management scope includes planning, budget, contractors, lawyers, management, new equipment purchases, process flows and regulatory controls. He feels that the most important item in this list is planning. His advice: first develop a detailed budget, inflating each line item by as much as 25 percent.

"Give yourself plenty of room for contingency because you will need it," he said. "It's better to have the funds allocated than discover in the build-out phase that you had not allowed enough money to make a necessary change. Reallocating funds at that point is difficult and soaks up precious time." He added that Hankins' leadership and involvement in the planning phase for staff and studio layout made his job easier.

Daughtry and his staff built models out of cardboard boxes to aid them in visualizing furniture and equipment layouts. The original plan had placed the studios in the middle of the large open space. The cardboard box models showed that the high studio walls would block the natural light from the windows. Because a bright environment creates a more productive work area, managers modified the floor plan to allow more light to filter through the whole space.

Daughtry also solicited ideas from the station staff, another successful management technique. On several occasions the staff made suggestions, including telephone equipment placement, that would

make their jobs easier. This teamwork approach yielded other benefits. Staff members felt some ownership in the plan because they helped develop it and were knowledgeable about the design process. They understood the reasoning behind staffing and studio placement decisions. In consequence, staffers knew what to expect when they walked into the new facility, and were excited about working in it, without second guessing.

Timing crucial

Daughtry also offered a warning. He said timing is important in the build-out segment. Often, a contractor would point out the cost savings or other benefits of installing a piece of equipment or wiring in advance of its original schedule on the master plan. If the contractor could justify the long-term benefits to the station instead of the short-term benefit for the contractor, Daughtry considered the earlier implementation. However, check your ego in such a situation. Confirm that the long-term benefits for the station are your priority. Don't make changes just because you have the authority to do so.

Daughtry checked all such proposed changes to the plan, small or large, with the other vendors to make sure the timing change would not affect their work or timing. More than once, he discovered that a proposed change would have a significant impact on the work of another vendor.

One of the best management decisions he made, Daughtry said, was to hire Builder's Permit Services in Washington, to help with the regulatory permits and inspections. The inspection and approval process can be tricky, tedious and lengthy. Using a person knowledgeable in the approval process of the local government saved the station weeks of delay by averting many potential problems raised by building inspectors.

According to Daughtry, the project manager should be on site during the build-out phase. This is not a job that you can do properly from a remote office. On site, the manager can answer worker questions and keep the project moving forward. Work need not stop while the contractor calls the project manager to get a clarification. On site, you also detect potential problems and can fix them before they cause a delay.

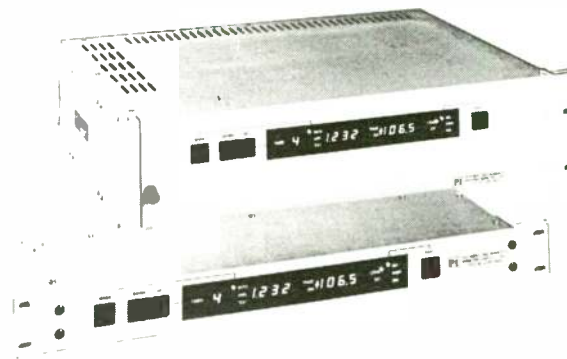
After several months, Hankins and Daughtry say, WPFW now has a bright new facility with improved staff communication and morale. The station has more predictable costs, a stable operating environment and improved sound and coverage. The effort, they say, was well worth it. Tip: In addition to the companies listed in this article, another architectural firm with nationwide experience with radio stations is The Lawrence Group in St. Louis.

□ □ □

Sue Jones is a principal in Bisset Communications, a communications management firm located in the Washington, D.C. area. She can be reached at (703) 503-4999.

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OFFBEAT RADIO

DJ Succeeds — Without a Voice

by Dee McVicker

PHOENIX Not even in his wildest dreams did Dan Lawrence think he'd become a radio announcer. In fact, Lawrence joked with his surgeon as he was wheeled into surgery to have his cancer-infested vocal chords removed that it looked like he'd never become a DJ.

But, he did become a DJ, and the only known voiceless DJ at that.

"Digital Dan," made his debut in February on KHUM(FM), a 100 kW commercial FM new to the Humboldt County area, 250 miles north of San Francisco.

"Talking" through a voice synthesizer hooked into the station's console, he wowed the small community with his wisdom and his words, however unconventional. "This is radio without the rules," he told listeners at the start of what would become two regular shows and a career in broadcasting.

Performer, actor

Before losing his voice in 1992, Dan Lawrence had been an actor at the Ferndale Repertory Theatre, North Coast Repertory Theatre and Pacific Arts Center in California. More recently, he was in the movie "Outbreak" as a daredevil helicopter pilot.

The idea for Lawrence to go on the air was the brainchild of Cliff Berkowitz, KHUM co-general manager and program director. It occurred to him one afternoon while the staff was playing around with the voice synthesizer. At the time, Lawrence was working at the station as a computer programmer and handyman, helping to ready the station for its on-air debut in January. The staff had been curious about the different voices and inflections of the voice synthesizer he used, and how, through his 486/100 MHz laptop, Lawrence taps out his comments for audible translation.

Berkowitz, although somewhat unsure

what listeners would think, suggested they do a test run on the air. He remembers thinking that Lawrence had an incredible knowledge of music and would be a perfect fit for the station's free-form format, but that "it was rather unorthodox. I didn't know of anyone who had done a radio show who didn't have a natural voice."

During Lawrence's test debut, the staff waited anxiously for any indication of listener response. In a charmed, albeit synthesized, voice, Dan Lawrence introduced himself as Digital Dan and assured listeners he was a real person. Within minutes, all concerns that he would not be accepted by listeners were allayed.

Immediate response

"The phones went crazy," said Berkowitz. "This lady called up and said she had just gotten out of the bathtub and that she had never called a radio station before, and that we had to put him on. We got calls from vets, and from everyone else out there. He lit up the phones for a half hour."

A week later, Digital Dan — so named because he uses his fingers, or digits, to communicate — was a regular on the air.

Like several other jocks at KHUM who enjoy total control of their shows at the free-form station, Digital Dan bases his two weekly shows on his passion of rock and roll and his experiences, particularly

those of the Vietnam era and the music played during that time.

His primary show is called the Digital Music Zone, or DMZ, which also stands for the demilitarized zone, where he spent a part of his tour as a helicopter flight engineer during the Vietnam War. It was out of his Vietnam experience, where he was exposed to Agent Orange, that some believe he developed cancer. The cancer started in his throat and spread to a lung, which was operated on earlier this year.

During his two-hour show on Thursday nights, Digital Dan plays Led Zeppelin, Pink Floyd — anything with a Vietnam memory behind it. "A lot of veterans have called to say: Way to go. Keep it up," he said. On Friday nights from 10 p.m. to midnight, he airs a Frank Zappa show.

Novel sound

Both shows were immediately well-received by the public, and the synthesized voice became an advantage, a sort of novelty. Warm, with a Scandinavian accent and a wide range of inflections available to it, the voice is known as Perfect Paul and is also used by famous physicist Steven Hawkins.

"I think people like it because it's different from anything they have ever heard on the radio," said Digital Dan. Once, a woman called to inquire why he didn't

use his own voice, and was embarrassed to learn that he did use his own voice, that of a DecTalk Express voice synthesizer with software Vocal-Eyes — a system designed to scan documents and "read" the text to the blind.

Using the audio portion of the system, Digital Dan prepares his opening commentary in advance, and while music is playing, he types in his comments on his laptop for the next break. The laptop interfaces to the console for on-air broadcast. An assistant is always nearby to answer the request line.

Digital Dan admits "being spontaneous is difficult ... but on the other hand, I never get tongue tied."

Indeed, he has a lot to say. "After listening to him for a while, you stop listening to the mechanical voice and you're just listening to the content of what he's saying," said Berkowitz.

Digital Dan is told by many of his listeners that the reason they tune in is because of a weekly commentary he has added to his show, regarding politics or whatever else is on his mind that week.

The shows in general are great therapy for him.

"It has allowed me to let others who are in similar situations know that there is a way for them to be able to speak, and that if you are motivated enough you can overcome any disability in life," he said.

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Dee McVicker is a free-lance writer and regular contributor to Radio World. She can be reached at (602) 545-7363 or via e-mail at roots@primenet.com

Williams Touches Lives

► continued from page 1

guidance, and each weekday evening, they come to the right place for it.

Friendly advice

Welcome to Bruce Williams' world. Some 7 million to 10 million listeners tune weekly to approximately 400 radio stations in the United States, Canada, Guam and the Caribbean, to get warm, friendly advice, a kind word and a smile.

A radio listener since he was a kid in New Jersey, Williams, who most often broadcasts from his home, didn't plan to make the medium his career. He said he never even gave the idea "a random thought." He wanted to be a millionaire.

Williams has never decided on just one enterprise. He has, in fact, been in "a ton" of them. For example, he's been a mayor and an author. He owns a barber shop and writes a newspaper column. And, he's on the radio. He not only broadcasts, he owns two talk stations in Texas.

Williams thought about getting into radio after hearing New York talker Bernard Meltzer on the air. He approached — no, hounded — the head honcho at WCTC(AM) in New Brunswick, N.J., for what seemed like an eternity before he got his first industry shot, a show called "At Your Service," in 1975.

"I harassed the guy for about a year," said Williams. "His locker was next to mine at the health club, and doing business in a jock strap when you look like me is a little difficult." Yet business was done, and Williams had begun his radio career.

At WCTC, Williams wanted more time on the air. Lacking a third class FCC

license, he was told he had to get one. So he studied for the test, passed it and was soon doing a nighttime show.

The man who said he "didn't know an ohm from a watt, then or now" wasn't very good with meter readings, either. He was happy that he never had to run an Emergency Broadcast System test. "Didn't have a clue how to do that," he said. "Just happily never happened on my watch." Turning off the transmitter at WCTC at 2 a.m. was easy, though. "An on and off switch I can figure," he said.

On to the Big Apple

In late 1978, Williams, perhaps the ultimate entrepreneur, made his way to the Big Apple airwaves. He settled in at WMCA(AM) for about three years. Once again, persistence, Williams-style, paid off. "I called them in excess of 3,000 times and sent them in excess of 500 letters and telegrams before I got my first interview," he said.

Williams hit the bricks in the Big Apple on WMCA's 2 p.m. to 6 p.m. Sunday slot, and was popular from the get-go ... which is not to say that the talker didn't help his own cause. He remembers getting "everybody I knew" to call in to his show. "I mean, I knew that they kept score, so I orchestrated it," he said. "You make things happen. You don't just expect them to happen. Life is not an accident. Business is not an accident."

Williams made the big leap to network radio in 1981, signing on to dispense advice to listeners via NBC Talknet. He worked with Sally Jessy Raphael, who left in 1986 to brave the world of television.

These days, people are listening to "The Bruce Williams Show" (the Talknet mantle was dropped about a year ago). Listeners

are most important to the show's host.

"The caller is really not the important person," he said. "It's the listener, because you've got one caller and hopefully at least a half a dozen listeners out there someplace."

Tackle all topics

Williams recognizes that radio talkers do affect people's lives.

At one of his personal appearances, a woman brought her daughter, who was wearing a neck brace, to meet him. "She said, 'My daughter listens to you in the car because I listen to you in the car,'" he said.

The woman mentioned that Williams constantly urges people to wear their seat belts. "She said, 'My daughter, awhile ago, got into a car with a group of teenagers and wouldn't let them start the car until she got her seat belt adjusted. The other kids all laughed. They're all dead.'" She suggested that Williams was the only reason her daughter was alive.

Williams is on the air nightly, ready to tackle all topics in his capacity as an expert on life experience. He has flown airplanes, and cracked one up (later, he broadcast from his bed at the Medical Center of Princeton, N.J.). He has raised five kids, and knows what it's like to "struggle to pay college tuitions."

When somebody calls him and says his septic tank is backed up, Williams can rise to the occasion, so to speak, because he's had the same thing happen to him.

Williams wants to meet and speak to his listeners. He returns phone calls and answers "every bitch letter" personally. "If somebody thinks that much of me, then I think it's important that I deliver," he said.

And deliver he does.

Williams thinks talk radio, which delivers, too, "is just going to do one thing: Get bigger. Gotta get bigger. The more people that listen to talk, the more people are going to listen to talk."

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Daybreak USA in Washington

USA Radio Network announced that WWRC(AM) in Washington is airing the nationally syndicated show "Daybreak USA." The 50,000 W station, which is positioned at 980 on the dial and covers much of the Eastern seaboard, airs the program from 6 to 9 a.m. EST.

"Daybreak USA" is a five-hour morning magazine program that focuses on current issues and topics with an informative and entertaining presentation. Delivered live via satellite, the show airs Monday through Friday from 5 to 10 a.m. EST.

"Daybreak USA" is produced and delivered

by USA Radio Network. The show currently has more than 100 affiliates. The Clearance Group in Dallas is responsible for the placement and clearance of "Daybreak USA" on stations across the country.

For more information about Daybreak USA, contact David Reeder at USA Radio Network in Dallas at (214) 484-3900, ext. 173; or Patricia Evans at The Clearance Group at (214) 669-1597; or circle Reader Service 180.

UBN to Launch Second Network

United Broadcasting Network Chairman Pat Choate announced that UBN will launch a second network of programs on

Sept. 16 that will include nine new shows. "We will be offering over 200 hours of programming per week, which will make us one of the largest syndicators of long-form radio in the industry," Choate said.

UBN will be offering two program line-ups. Most new programs will be part of the new Red Network. The newly named Blue Network will consist of most of the present network program schedule, with the addition of Jim Hightower's "Chat and Chew."

UBN programming ranges from news and general interest to specialty programs. All programming is designed to educate, entertain and enhance the listener's life. Most programs feature guests

and live listener call-ins.

UBN operates a satellite-delivered full-time 24-hour news and talk radio network carried on nearly 300 stations.

For more information on the United Broadcasting Network, contact the company in Florida at (904) 397-4300; fax: (904) 397-4149; or circle Reader Service 234.

Telling the Truth' Nationwide

On Sept. 1, "Telling the Truth" launched a new 15-minute daily edition nationwide. Featuring the teaching of Stuart and Jill Briscoe, the program also will be heard on selected stations internationally.

Stuart Briscoe serves as pastor at Elmbrook Church in Brookfield, Wis., where more than 6,000 attend weekly. He came to Elmbrook in 1970, after more than a decade with the Torchbearers organization, a youth ministry with global commitments.

Jill Briscoe also speaks regularly at Elmbrook Church where she serves as an advisor to the Women's Ministries. She is also executive editor of "Just Between Us," a publication for ministry wives, and serves on the board of directors for both World Relief and Christianity Today.

For more information on "Telling the Truth," contact the Ambassador Advertising Agency in California at (714) 738-1501; fax: (714) 738-4625; or circle Reader Service 3.

Crook and Chase Introduce Specials

Jones Satellite Networks and The Crook and Chase Country Countdown offer radio programmers an option for their holiday programming needs: the CenterStage Specials. These holiday specials include Thanksgiving and Christmas programs that will be hosted by Lorianne Crook and Charlie Chase.

Both the Crook and Chase Country Countdown and the CenterStage Specials are four hours in length and delivered on CD.

For more information on The Crook and Chase CenterStage Specials or The Crook and Chase Country Countdown, contact Gene Ferry at (303) 784-8700; or circle Reader Service 62.

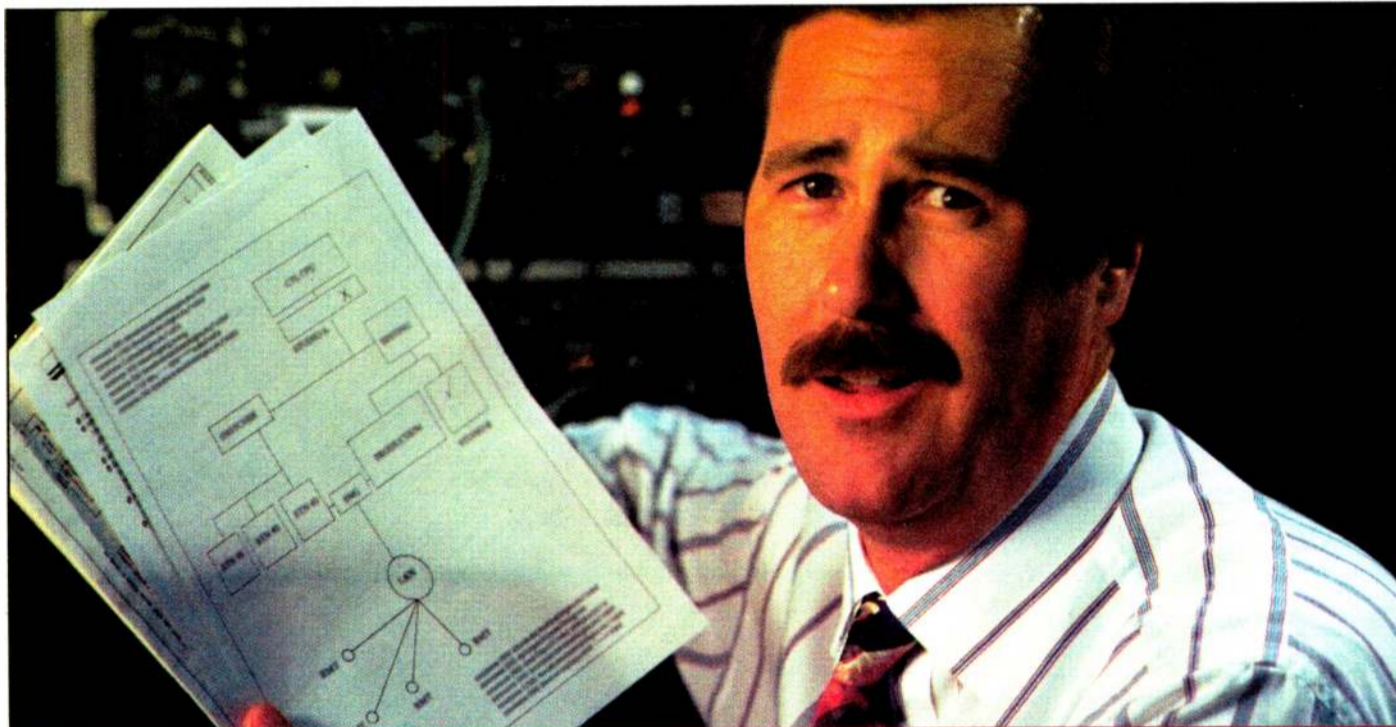
Sports Byline Launches Spanish Program

Sports Byline USA announced the launching of "Sports Byline Spanish," the first national, Spanish-language sports talk program. The three-hour program will debut in January, 1997.

"Sports Byline Spanish" will focus its programming on sports traditionally associated with Hispanic audiences, such as soccer, boxing and baseball, as well as on the NFL, NBA and NCAA.

The show will feature nightly interviews with major Spanish-speaking sports personalities. Sports fans will be able to talk with their sports heroes and the program's hosts via a toll-free 800 telephone number.

"Sports Byline Spanish" will air live, Monday through Friday from 10 p.m. to 1 a.m. EST. The program will be available to radio stations on a barter basis. For more information, contact Kevin Mulligan at Mulligan Media Management in California at (503) 249-2160; or Matt Hurwitz at Sports Byline USA in California at (415) 434-8300; or circle Reader Service 207.



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The Old Professor Remembered

► continued from page 46

answering questions about popular songs. The show aired on the Mutual Network briefly, then moved to NBC and became a smash hit in the ratings. It aired for an hour on Wednesday nights, sponsored by Lucky Strikes.

Kyser quickly became a major star. He would delight his studio audience by coming on stage wearing a cap and gown. After all, he was "The Old Professor." Members of his band wore beanies and campus-style sweaters with letters on them.

"Evenin' folks," he'd greet his listeners in a charming southern drawl, "how ya all?" It was the start of one of the most successful shows in radio history.

shows from camps, bases and hospitals than Bob Hope, more than 550 in all.

On June 7, 1944, Kyser married Georgia Carroll, one of the most famous and beautiful fashion models in the nation. She appeared with the band for a while, but gave up her modeling career.

After the war, Kyser limited himself to his radio shows and brief theatrical tours. He had kept up the show and made movies when not playing military posts, but when he stopped making movies, he never returned to them.

He remained on the air with high ratings until 1949. By then, television had arrived. During the early 1950s, Kyser brought his "Kollege of Musical Knowledge" to daytime TV, where it

And he worked on other state projects."

During the late '60s and early '70s, Kyser spent five years working in Boston for the Christian Science Church. "He commuted every week from North Carolina," said Georgia. "He'd be home on weekends and for important holidays and anniversaries, of course, but he spent most of his time up in Massachusetts, where he was in charge of the church's radio and TV department."

By then, the former entertainer called himself James Kyser. Reporters often approached him for interviews, but he declined them.

After his Boston years, he returned home to North Carolina, where he

worked on the development of the state PBS program for a number of years.

"My husband never went before the cameras, nor did any radio work," said his widow. "He worked behind the scenes, and he enjoyed what he was doing." She added, "My husband wanted a different life. When he quit show business, he quit completely. He never regretted the move."

The American Movie Channel has played some of his movies recently, causing a revival of interest in Kay Kyser, and there is talk of a documentary about the great radio star.

He may have left show business, but the memories of his famous Wednesday night show linger. It was one of radio's most popular shows, and may well have been the most popular quiz show ever on the airwaves.



Kay Kyser with Singers Sully Mason, Harry Babbitt and Ginny Simms

Kyser had a ready wit. The questions were usually on the humorous, often silly, side. The band would get into the act by playing musical questions and by performing popular songs, old and new, between questions and commercials.

It was an accomplished band. Ginny Simms, the female vocalist, later became a favorite with servicemen during World War II. The male singers were Harry Babbitt, Sully Mason and, along the way, Mike Douglas, who later succeeded in TV. The King Sisters were with Kyser for a while; they too became TV stars.

"Ish Kabibble," sort of an early Jerry Lewis, earned a household name by singing novelty songs. His real name was Merwyn A. Bogue. Interestingly, most of the original on through the group's long life.



The Old Professor with Comic Sidekick Ish Kabibble

A movie a year

Kyser turned to movies next. On screen, he was not just another orchestra leader fronting his band while the hero and the heroine solved their problems: Kyser, a natural comic, was the star. Starting in 1939 when he signed with RKO, "The Old Professor" made a picture a year. In order, they were "That's Right, You're Wrong," "You'll Find Out," "My Favorite Spy," "Around the World," "Swing Fever" and "Carolina Blues."

It was wartime, and he took his band to military posts around the world. According to one estimate, he did more

earned high ratings. Shortly thereafter, however, he announced his retirement from show business.

Tennessee Ernie Ford tried his hand at presiding over the "Kollege" on TV, but without Kyser the show did not last long.

When Kyser quit show business after a quarter of a century, he and his wife

moved to Chapel Hill, where they raised their daughters Kimberly, Carroll and Amanda.

"When Kay retired from show business," said Georgia Carroll Kyser in a recent interview, "he told me he was never going back to it again. He told me he wanted to do something different, to lead a conventional life. And I must say, he kept his word."

The retired radio star performed public service work for his home state. "He helped to get the state's 'good health program' established. He was quite involved in that,

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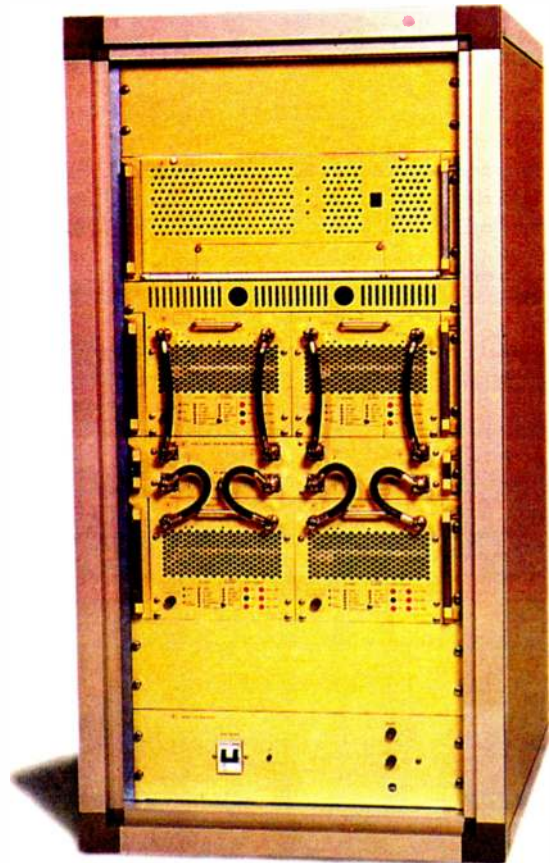
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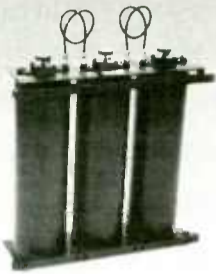
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READER SERVICE NO. 158

KEYBOARD CONNECTION

Harness the Power of the Internet

by Barry Mishkind

TUCSON, Ariz. Depending upon which survey you read, between 50,000 and 400 million people sign up on the Internet each month. Some industry observers predict massive electronic "traffic jams" soon, reducing data transfer to a trickle. Other surveys report less than 25 percent of people in the United States have ever signed on to the Internet or related services.

Of course, the truth lies somewhere in the middle. The Internet is growing rapidly; new Internet Service Providers (ISPs) are popping up in city after city, and many businesses have discovered that the Internet and its World Wide Web present an efficient, economical way to do business.

Getting started

One major corporation found that using e-mail saved more than \$400,000 during the first year compared with the cost of faxing information to other offices. With the potential for savings like that, many broadcast industry companies are looking at ways to use the Internet to their advantage.

The first step in getting access to the Internet is finding the best ISP for your needs. In many locations, you can obtain unlimited access on a local phone number for as little as \$8.25 per month. (However, please remember that quality of service is far more important than a few dollars. If you cannot get past busy signals or poor connections, a cheap monthly fee is false economy.)

If you are on the road a lot, one of the national ISPs may fit your needs, or you might consider a combination of local and national.

Why both? Some folks must access their e-mail while on the road, for example, so they get a subscription to a service like CompuServe, allowing them access from virtually anywhere in America or Europe. However, if you have a lot of e-mail, you may end up paying substantial hourly charges. An e-mail address on your local ISP avoids those charges.

Although multiple access points also give you multiple e-mail addresses, this need not cause confusion. First, you can set up one address to forward mail to another. More importantly, once you access the Internet, you normally can retrieve your mail from wherever it is located, because mail systems normally do not care from "where" you poll. Just tell your mail reader the name and password of your e-mail account, and it will go "find" your e-mail. It really is easier than you might think.

Easy access to software

Now let us talk about the software that makes all this possible. It need not cost you a bundle; in fact, a lot of it is free. Some of it may already be on your computer. If you have Windows 95 installed, you will find a dialer, e-mail client and a browser, the Microsoft Internet Explorer, already included. MS has even announced future IE upgrades will be free. You cannot get software any cheaper!

Also, expect your ISP to offer you a starter set of diskettes with a dialer, e-mail client and a copy of a browser. Some people are happy with these; others want additional features found in other programs.

By the way, we have seen a great deal of debate over the respective merits of the Internet Explorer and the Netscape Navigator. Both browsers have matured a great deal since their release, and now offer all sorts of features and plug-ins, including options where you can actually talk to another person over the Internet. Predictably, the long distance companies are not amused.

While Microsoft and Netscape try to outdo each other with each revision, for most users they are essentially interchangeable. It really depends on your preference. Netscape is not free, however. You are supposed to register and pay for it.

If you are running Windows 3.1, or another operating system, you will want to connect to the Consummate Winsock Applications site at <http://cws.wilmington.net/>. This site not only has a huge selection of freeware and shareware, it has reviews to guide you in selecting the

best current software for accessing the various Internet services.

Among the excellent free programs you may wish to seek at the Consummate Winsock Applications site are Trumpet Winsock, a dialer you can script to log in automatically to your ISP; Pegasus, an e-mail reader; and Free Agent, a newsreader. Other programs are available for download so you can try before you buy in most cases.

Moving up to a home page

Now, we are getting to the fun stuff! A home page is a "place" in cyberspace where you can advertise your station or business so anyone, anywhere in the world, can read it. Using one of the various Web authoring tools, you can easily turn your text into a nicely formatted display.

Many broadcast stations have started to use Web pages for communication with the public. Examples include station program schedules, features, upcoming

events, news, weather reports and radar pictures, sports scores, polls on questions or music research, and messages to and from viewers or listeners.

The Web can also expedite internal station needs: salespeople can access avail sheets or even enter orders from the field. On remote broadcasts, studio and talent can communicate easily on the Web.

Uses of the Web by manufacturers or vendors include the display of equipment and specifications, descriptions of services and customer service information. Even when no one is in the office, the customer can inspect maintenance manuals, key schematics and troubleshooting tips. Making such information available can reduce the load on the technical support staff.

But the big boss wants to know: Can you make any money from all of this?

The answer is a resounding yes! Some ideas for making money and ways to implement them will be the topic of a future article.

□ □ □

Reach Barry Mishkind at (520) 296-3797; or barry@broadcast.net via the Internet. Check out his home page at <http://www.broadcast.net/~barry/>

MARKETPLACE

Recently Introduced Products for the Radio Broadcast Professional

Audio CD Generator

For broadcast, audio recording and duplicating facilities that are Mac- and PC-based, MediaForm now provides a total turnkey solution for premastering and duplication with the Audio CD Generator. The system centers around



the Genesis CD 2500 Autoloader to provide unattended duplication of up to 25 disks utilizing a Yamaha 4X CDR 100, which is inside the Autoloader. The system includes advanced Red Book audio features such as full manual PQ-subcode editing, index number and track number. The system also includes SCSI controller, 25 caddies, 25 CDs and a 12-month warranty.

For more information from MediaForm, contact Joe Alfonsi in Pennsylvania at (800) 220-1215; e-mail: j.alfonsi@mediaform.com; or circle Reader Service 38.

Raxxess Debuts Studio Furniture

Raxxess Metalsmiths recently introduced a new line of modular studio furniture featuring both complete systems

and a variety of component parts.

As complete systems, the studio furniture is available in the "New Yorker" and the "Texan." The New Yorker is designed for use where economy of space is a key consideration, while the Texan features a larger surface area for users whose usable space is not at a premium.

The center desk is available in 36- and 48-inch formats. The top is a black, laminated particle board surface that can be used with the all-steel base. Floor levelers are included.

For more information from Raxxess, contact the company in New Jersey at (201) 523-5105; fax: (201) 523-5106; or circle Reader Service 5.

Data Remote

Data Remote from Phonetics Inc. produces and communicates reports from remote equipment. It can attach to data loggers, chart recorders, network servers, phone systems, computers or any device with an RS 232 output port, and give you instant reporting capability over standard phone lines.

Data Remote has two alarming functions: an inactivity alarm and alarm keyword detection. Activity through the serial port is monitored. If it detects a period of inactivity, it will send an alarm message. In addition to fax, computer and e-mail, Data Remote can send alarm messages via alphanumeric or numeric pagers, too.

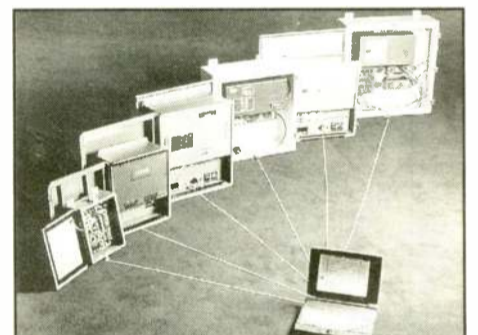
For more information from Phonetics Inc., contact the company in Pennsylvania at (610) 558-2700; fax: (610) 558-0222; or circle Reader Service 7.

Six New PQNode Models

The PQNode family of power monitors now includes six members. All are controlled using Power Evaluation Software for Windows. The broad offering lets users begin system monitoring at an appropriate level and build capability as needed. With a system,

users can monitor and collect data continuously for benchmarking, identifying trends and spotting anomalies that signal potential problems.

All PQNode models monitor three-phase power and, depending on the model, monitor everything from power quality, power flow and harmonics to initiating telephone calls when disturbances occur.



For more information from BMI, contact the company in California at (800) 876-5355; fax: (408) 970-3720; e-mail: bmisales@bmi.electrotek.com; or circle Reader Service 34.

New EQ Technology

Symetrix Inc. has announced the development of the 551E five-band parametric EQ, featuring a new approach to equalization circuitry, known as UltraQ. The 551E incorporates five fully overlapping bands, each allowing for a range of 10 Hz to 20 kHz, and independent knobs for adjusting frequency, bandwidth and boost/cut. The 551E also features a THD+ noise of <0.002 percent and numerous options.

Other features include low and high cut filters as well as both XLR and one-fourth-inch connectors for easy installation. The 551E is UL and CE approved.

For more information from Symetrix, contact the company in Washington at (206) 787-3222; fax: (206) 787-3211; or circle Reader Service 208.

Transmitter Progress

► continued from page 19

Consumers, he says, will be the final arbiters of whether DAB is a good thing. "They're going to determine how successful this whole arena is going to be. If they don't jump on the bandwagon and say, 'Oh, yeah, we love this,' and 'This is what we want to start listening to,' then it's going to just take another small piece of the pie, just like digital audio over satellite has taken."

Jorgen Jensen, manager, sales and marketing for Nautel, which will exhibit at WME, agrees that radio stations can't choose to wait for DAB to become a reality: they have to buy transmitters now. A year or two ago, he says, "People slowed down and we saw a serious concern. Six months ago, people seemed to be forgetting about those concerns and (were) saying, 'Let's get on with what we know.' We've seen reasonably strong sales in

CCA Electronics, says that out of the last 200 customers he's spoken with in the last six months, "Nobody's even said the word DAB." This comes, he offers, as no surprise to him.

"It seems to me that the big market guys — the major players in the radio industry — are ... interested in DAB, but once you move away from a major market or a big national chain, ... nobody else even opens their mouths about it," notes McElroy. The excitement and hype at the engineering level, he suggests, "hasn't filtered down to the local engineering level or the local radio station level. The last thing on their minds, it seems like, is DAB."

CCA addresses the question of future

compatibility with DAB in a letter included with price quotations to customers. The letter states, "Many broadcasters would prefer that DAB utilize the existing FM band as it would create no new competition."

Competition aside, industry observers ask whether consumers will accept DAB. For example, how will consumers who spend an appreciable amount of time in their cars greet the technology? As Nautel's Jensen says, at least at home "you have the opportunity to take advantage of any improvement in audio quality."

However, he adds that even at home, "people are listening for format as much as they are for audio quality."

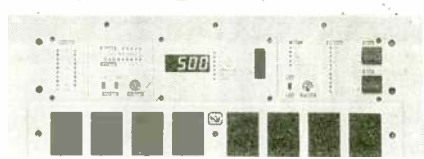
An even bigger question is at hand: Is a transition to digital even necessary?

An industry observer who wished to remain anonymous questioned whether

people who listen to radio could tell the difference "between a radio station that's doing digital broadcasting and a radio station that's broadcasting in analog."

The source said, "We keep forgetting that John Q. Public is a non-educated, non-informed listener. Most people couldn't tell you that the radio station they're listening to plays compact discs or (is) running analog tape." Do we really need digital broadcasting? "My opinion," said the source, "is no."

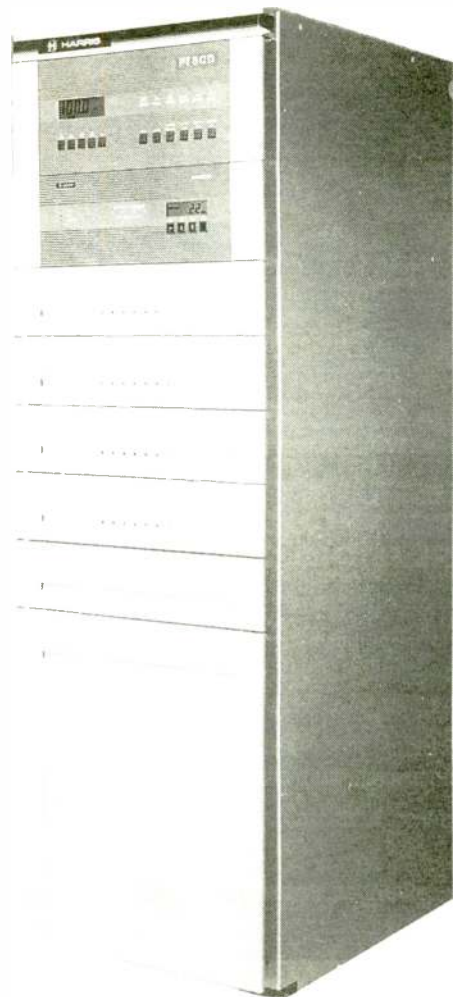
A booklet from Harris typifies the approach taken by manufacturers. "Everything You Always Wanted to Know about DAB But Were Afraid to Ask" states: "The smartest course of action is to make new equipment purchases with DAB in mind, and to maintain the best, most efficient and modern broadcast facility possible in order to smooth the transition once it occurs."



The Crown FM500

U.S. AM and FM transmitters." Jensen says that Nautel is ready to go with in-band, on-channel DAB.

The FM broadcast division at Crown



The Harris PT 5CD

primarily targets the lower power market and will appear at WME. Before starting a recent leave of absence, sales manager Mark Potterbaum told RW he thinks low power stations will eventually come around to DAB, although "it's going to be years from now." At this point, he noted, Crown is "cautiously watching everything" in the U.S. market.

Steve McElroy, vice president, sales at

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FM Airchain Problems

► continued from page 21

the insulating gap between the inner and outer conductors.

Insulator failure occurs in other locations and does not always relate to a mechanical part of the system. Air or other gas, usually an excellent insulator, separates the inner and outer conductors of the transmission line and antenna. However, when an imbalance in the system causes peak voltages to rise above the breakdown potential of the insulating gas, an arc-over can occur. Photo 3 depicts an arc-over in a rigid line section that propagated for several feet.

Another cause of arc-over between the inner and outer conductor, in addition to

insulator electrical failure, is a lack of mechanical support by the insulator. This type of failure usually occurs in



Lightning Damage to Antenna Insulator

bends or horizontal runs of transmission line. The weak support allows the inner

conductor to migrate toward the outer conductor. As the separating distance decreases, so does the breakdown potential. This can allow flashover.

Most antenna systems also have an external insulator between the antenna feed conductor and the external antenna neutral body. Flashover can occur here as well. See photo 4.

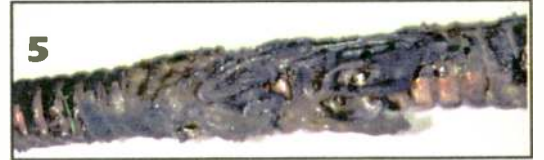
Environmental factors can also contribute to system inefficiency. Of these, ice and lightning are the most significant.

Clearly, falling chunks of ice can effect a mechanical change in the antenna system. Accumulation of ice on the antenna element will also produce a less efficient energy conversion.

Antenna designs usually employ a standard input impedance such as 50 ohms to match the characteristic impedance of the transmission line to

produce the most efficient transfer of energy. Antenna ice changes the input impedance. As the match between line and antenna diverges, the efficiency of the system decreases. The result: reflected energy and an increase in the peak voltages and currents (VSWR) in the transmission line. Photo 5 is an example of 4-inch flexible transmission line damaged by reflected energy.

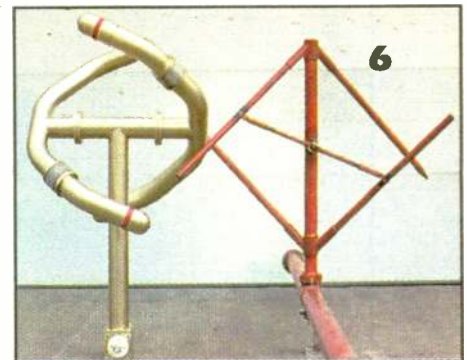
The physical size of the antenna and particularly of the antenna feed mechanism affects the magnitude of the change



Flexible Transmission Line Damage Due to Reflected Energy (VSWR)

in antenna impedance. Antennas with an internal (protected) feed mechanism are less susceptible to input impedance changes caused by ice accumulation. Also, antennas with large-diameter radiating arms are less affected by radial ice accumulation than are antennas with smaller-diameter arms. Photo 6 shows internal and external feed designs. The internally fed is on the left.

Properly installed, an antenna system should provide years of reliable service. But maintenance is important. Observe the operating parameters daily and note any changes. These parameters could include change in reflected power values,



Internally Fed Antenna on Left, and Externally Fed Antenna on Right.

loss of transmission line pressure, heater current values, excessive heating in the transmitter, and distortion or AM noise in the received transmission.

Conduct a visual inspection of the system at least once a month and after every severe storm. Using field glasses, observe the transmission lines, hoisting grips and grounding kits for secure attachment to the tower. Check the antenna and any parasitic or reflective elements for proper orientation.

Once a year, inspect the tower and antenna system physically. Check and tighten all external mechanical connections. Consider changes in the system due to environment. Damaged radomes may collect water and periodically affect the VSWR readings. Lightning strikes can indicate loose or poor tower grounding.

At approximately seven-year intervals, replace the antenna system's gasket seals and in-line bullets. Inspect the system using a time domain reflectometer (TDR) and compare the results to the installation plot and subsequent measurements.

With proper maintenance and barring physical damage, an antenna should last 25 to 30 years.

□ □ □

Thomas Silliman, P.E., MSEE, is president of ERI. David Davies, BSME, CE, is a staff engineer. James Kemman of ERI also assisted with this article.

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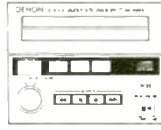
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Phone: (719) 634-6319 Fax: (719) 635-8151

TRANSMITTERS...WTS

Collins 830E-1A 5 kW FM xmtr, (2) cabinets, 250 W driver & 5 kW PA, \$3500; 4CX500 final tube, 50 hrs, \$500; Rotogen 3-phase gen 30 amps 230 volts output. Randy, KDKD, 2201 Antioch Rd, Clinton MO 64735. 816-885-6141.

BESCO World Leader in AM-FM Transmitters
"Now in our 30th year!"

116 AM & FM Pre-Owned Units in Stock

- ✓ ALL - Powers
- ✓ ALL - Manufacturers
- ✓ ALL - Instruction Books
- ✓ ALL - Complete
- ✓ ALL - Spares

Call and take advantage of our liberal trade-in plan. Tune and test on your frequency, available on site. Complete inventory on request.

Phone: 1-214-630-3600
Fax: 1-214-226-9416

Continental 814B 1988 FM, 4.3 kW, new IPA & blower, G Hearl, 540-964-7416.

New McMartin 20W, B1M8000 FM exciter, New McMartin B1M10050 FM relay rebroadcast rear; also some used McMartin B9110 exciter, 15W, Goodrich Enter., 11435 Manderson St, Omaha, NE 68164
402-493-1886 fax 402-493-6821

Elcor SW-50K-4 50 kW auto-tune shortwave xmtr, 2-18 MHz, new w/warranty, \$185,266. J Gorski, JLG Prod, Box 266, Vinton IA 52349. 319-472-5102.

Elcor BT-100 10 kW AM xmtr, will tune, expanded band, new w/warranty, \$48,540. J Gorski, JLG Prod, Box 266, Vinton IA 52349. 319-472-5102.

Cetec/Sparta 1.5 kW FM xmtr w/out exciter, stereo gen, gd cond, \$3500. J Arzuaga, WLAZ, Clarmont FL. 787-895-0000.

Gates BC-5P2S AM, 900 kHz, 5 kW, runs but needs work, extra parts, manual; Gates BC1J, 900 kHz, 500-1000 W, gd cond, some parts, manual, L Osborne, WZLK, 446 By Pass Rd, Pikeville KY 41501. 606-432-9805.

Gates BC1G 1 kW/500 W AM on 1320 kHz, clean, '71 vintage, will deliver within 200 miles of

CCA ELECTRONICS

USED TRADES

Harris FM2 5k 2.5kw \$9,500
w/FM MX-15 exciter
BE FM3.5 3.5 kw FM \$11,500
w/ FM FX 30 exciter
Harris FM10G 10kw \$9,500
w/FM Collins 310Z exciter
CSI FMT3F 3kw FM with \$7,500
w/EX 20 exciter
AEL FM 5kw \$6,000
Harris AMS X-1 \$6,000

CCA DEMOS

FULL 3 YEAR WARRANTY!

CCA FM 100GS 100w FM Exciter \$4,200

NEW SPECIALS!

3 YEAR WARRANTY!

AM 1000D 1kw AM \$10,500
FM 1000SS 1kw FM \$12,000
Compact Solid State
Call Steve, or Tyler
770-964-3530

Charlotte NC, \$2500. B Elliott, WRFX, 915 E 4th St, Charlotte NC 28204. 704-338-9970.

Used equipment for sale: Belar SCM-1, Belar RFA-1, Belar FMS-1, Belar FMM-1, Moseley MRC 1600 system, TFT EBS receiver/generator, Gentner patch panel, and Harris racks. Call Transcom Corporation 800-441-8454 or 215-884-0888.

Want To Buy

Gates BC1-T & Gates Studioette console manual & schematics. J Bromley, 9505 Bryn Mawr Cir, Ft Smith AR 72908. 501-648-9138.

Prices on used AM 1000 W xmtr & antenna for bdctg in Honduras. J Boyer, 704-262-6384.

McMartin AM/FM xmtr, any model, exciter or stereo modules. Goodrich Ent., 11435 Manderson, Omaha NE 68164. 402-493-1886.

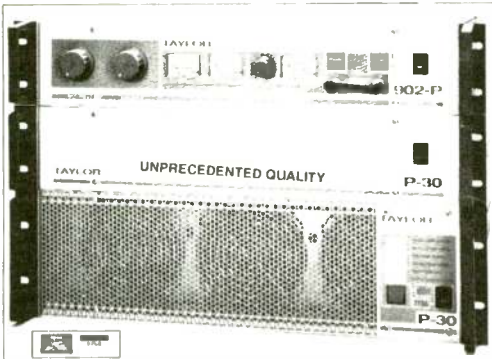
TUBES

Want To Sell

4CX250B, 833C, 4-400, 3CX1500A7, 807, 4-125A, 4CX350A, 4-1000, EIMAC, AMPEREX, RCA. Westgate 800-213-4563.

FOR THE BEST PRICE
& 24 Hr service on transmitting tubes call Goodrich Ent Inc at **402-493-1886** day or night, FAX **402-493-6821**.

INCREDIBLE TRANSMITTERS



TV TRANSMITTERS

1Watt	\$1,114
2Watt	\$1,664
4 Watt	\$2,138
20 Watt	\$3,880
40 Watt	\$5,046
100 Watt	\$6,206
200 Watt	\$9,874
400 Watt	\$13,171
800 Watt	\$18,295
1KWatt	\$22,900

FM RADIO TRANSMITTERS Including Stereo Encoder

1Watt	\$1,138
30Watt	\$1,499
300 Watt	\$3,174
600 Watt	\$5,960
1K Watt	\$8,716
2K Watt	\$11,905
4K Watt	\$20,741

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FAX: (708) 208-2550

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Quality Rebuilt Tubes
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- Applications Support
- Committed to Quality

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Int'l. (415) 592-1221
or Fax 415-592-9988

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1-800-348-5580
FAX: (708) 208-2550

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8877/4CX250B/833A
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4CX 3500/5CX1500
and much more!
Factory Warranty!

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(352) 688-2374

Se habla Español
FAX: (352) 683-9595

Svetlana ELECTRON DEVICES

Quality* Power Tubes

3CX2500A3	4CX15.000A
3CX2500F3	4CX15.000J
3CX2500H3	4X150A
3CX3000A7	5CX1500A
3CX3000F7	5CX1500B
3CX10.000A7	572B
3CX10.000A7	574G
3CX10.000H3	SV6550C
3CX15.000A3	6AS7G
3CX15.000A7	6BM8
3CX15.000H3	811A
4CX250B	833A
4CX250BC	833C
4CX250BM	EL34
4CX250R	SV811-3
4CX350A	SV811-10
4CX350AC	TH5-4
4CX400A	TH5-6
4CX800A	TH6-3
4CPX800A	TH6-3A
4CX1500A	YC130,9019
4CX1600B	8560AS
4CX1600U	SK300A
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4CX5000A	SK1320
4CX10.000D	

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

Broadcasters
Phone: 800-239-6900
205-882-1344
FAX: 205-880-8077

OEMs, Distributors
Phone US: 800-578-3852
Int'l & US: 415-233-0429
FAX: 415-233-0439

Want To Buy

3" CRTs w/P5, P11 or P16 or blue to violet phosphor, 15GP22, 12LP4C & 21AXP22A; RCA 621TS complete, CBS Columbia 205C2 w/gd CRT & UHF. M Vincent, 2101 Camborne Rd, Richmond VA 23236.

TURNABLES

Want To Sell

Technics SP-15, 3 speed, pitch, 4 headshells & assorted Stantons. w/Calzone case, \$400. G Hansuld, Act Radio. 718-274-0771.

TRANSCOM CORP.
Serving the Broadcast Industry Since 1978

Fine Used AM & FM Transmitters and Also New Equipment

For the best deals on Celwave products, Andrew cable and Shively antennas.

1 KW FM 1978 Collins 831C-2	1 kW AM 1982 Harris SX1
1 KW FM 1988 Harris FM1K	10 kW AM 1974 CSI T-10-A
2.5 KW FM 1977 Sparta 602A	10 kW AM 1980 Harris MW-10
3.5 KW FM 1979 McMartin BF3.5M	10 kW AM 1976 Continental 316F
5 KW FM 1969 RCA BTF 5D	25 kW AM 1982 CSI T-25-A
10 kW FM 1968 RCA BTF 10D	50 kW AM 1978 Harris MW50C3 (1100 KHZ)
10 kW FM 1976 RCA BTF 10E	50 kW AM 1978 Continental 317C-1
20 kW FM 1974 Collins 831G2/Cont 816R2	50 kW AM 1973 Continental 317C
20 kW FM 1975 Harris FM20K	50 kW AM 1981 Continental 317C-1
	50 kW AM 1982 Harris MW-50B

1077 Rydal Road #101, Rydal PA 19046
800-441-8454 • 215-884-0888 • FAX No. 215-884-0738

IF YOU WISH TO CONTACT OUR HOME PAGE,
WE ARE AT WWW.VOICENET.COM/~TRANSCOM
IF YOU WISH TO E-MAIL US, WE ARE AT TRANSCOM@VOICENET.COM

WHEN YOU'VE GOT SOMETHING THIS GOOD, YOU CAN'T HELP BUT BLOW YOUR OWN HORN!

There comes a time when a company knows it has a break through product. And for Energy-Onix, that time is now.

The **ECO 15-30**, Single tube, High Power Grounded Grid Transmitters up to 32 KW.

- ◆ Solid State driver up to 2 KW serves as emergency transmitter
- ◆ Straight Forward field proven control system
- ◆ VSWR Protection & More

◆ BEST OF ALL THEY ARE ECONOMICALLY PRICED!

Energy-Onix
"The Transmitter People"
518-828-1690
FAX: 518-828-8476

752 Warren Street, Hudson NY 12534

Circle (172) On Reader Service Card

Circle (173) On Reader Service Card

EMPLOYMENT

To place ads in this section, use the ActionGram form. To respond to box numbers write Radio World, PO Box 1214, Falls Church, VA 22041. Attn: _____

HELP WANTED

POSITIONS WANTED

Technician/Operator... WJR Detroit

Position requires a minimum of two years Broadcast Audio experience and two years of technical training. Responsibilities include equipment maintenance and installation, studio and remote operations. RESUMES ONLY to: Ed Buterbaugh, Director of Engineering, WJR Radio, 2100 Fisher Bldg., Detroit, MI 48202. EOE

Sales - Technical

Incentivized sales and technical support on new products from established manufacturer for broadcasting and cable TV. Excellent working environment in a fast-growing, high-tech company. Earn up to \$100K annually, depending on skills and experience. Full employment benefits, 401(k) and bonus.

Send resume to: ATTN: Human Resources 530 Lawrence Expressway Suite 531 Sunnyvale, CA 94086

Beasley Broadcasting Group

owned stations in eastern North Carolina seek full time Chief Engineer. Currently own two Class C's and one AM. Great stations and company. Competitive compensation package. Send qualifications to Bruce Simel, PO Box 3436, New Bern, NC 28564. EOE.

Advertise!

Call your advertising representative
1-800-336-3045
Ext.154

Chief Engineer seeking FT. stable position for Midwest. Over 17 yrs exper in FM, FM directional & studio work & construction, well organized & hard working. 402-488-6635.

Mature male looking to manage country formatted station in a southern state, 30 yrs exper in sales & management. Jay, 616-777-2845.

Somerset County NJ graduate w/FCC licence is ready to put his talents to work at your NJ station. Brian for demo tape. 908-359-3085.

Young lady w/gd on-air, prod & copywriting skills, talented, ready for work. Shanna, 405-524-2166.

Female voiceover talent Chris McKay is ready to ship out your stations new liners promos spots. DAT or reel, cheap, get the demo. 612-487-0922.

News, sports, on-air work. I'm looking for a team-oriented station. I'm dependable, loyal & hard-working. Keith, 405-273-1482.

Professional announcer, network voice, former VOA, government budget cutting casually wants relocation to southeast, on-air announcing, production. Alex, 513-777-8423.

Rockin Robert will energize your ratings, former A/V tech. FCC licence, tape demo avail. R Rice, 801 Eldon St. Herndon VA 20170. 703-532-3400.

Sportscaster w/8 yrs exper, seeks play-by-play position. Strong production & other skills as well, will relocate. Deric, 406-782-3896.

ADVERTISE!
space available
1-800-336-3045
Ext.154
call now!

ABOUT OUR EMPLOYMENT SECTION

HELP WANTED

Any company or station can run "Help Wanted" ads for \$1.50/word or buy a display box for \$60/column inch. Payment must accompany insert, use your MasterCard or VISA; there will be no invoicing. Blind box numbers will be provided at an extra charge of \$10. Responses will be forwarded to listee, unopened, upon receipt. Call 800-336-3045 for details.

POSITIONS WANTED

Any individual can run a "Position Wanted" ad, FREE of charge (25 words max), and it will appear in the following 2 issues of Radio World. Contact information will be provided, but if a blind box number is required, there is a \$10 fee which must be paid with the listing (there will be no invoicing). Responses will be forwarded to the listee, unopened.

Mail to: **BROADCAST EQUIPMENT EXCHANGE**

PO Box 1214,
Falls Church, VA 22041
Attn: Simone Mullins

AM FIELD PEOPLE

needed across the U.S. to do partial proofs. We are seeking to build a network of reliable field engineers. Prior AM field measurement experience a must. Part-time at first, we have plenty of work coming up, the time to sign-up is now. Fax per-day rate, number of yrs of AM medium-wave experience to: Bill Sacks at 703-534-7884.

Radio Equipment Sales Openings

Well establish East coast broadcast equipment supplier has sales department openings for:

Two sales engineers capable of configuring high end studio systems, hard disc storage systems, and complete transmitting systems. Positions require heavy digital and system design experience as well as good written and verbal communication skills. Hands on experience with Wheatstone consoles and Broadcast Electronics transmitters, and Digital hard disc storage systems preferred. Positions require prospecting, seeking out and closing sales and is not a telephone order taking position. Possible relocation and willingness to travel is required.

One telephone order person to handle accessory and support product sales from our main office in Glen Falls, N.Y. Send resume's to or contact Rich Redmond, at Northeast Broadcast, P.O. Box 1179, So. Glens Falls, N.Y. 12803 (518) 793-2181

Radio World

FREE Subscription/Renewal Card

I am in the broadcast industry and I would like to receive or continue receiving Radio World FREE. YES No

Signature _____ Today's
Date _____
Please print and include all information:
Name _____
Title _____
Company/Station _____
Address _____
City _____ ZIP _____
State _____

Type of Firm (check one)
 D. Combo AM/FM stations F. Recording Studio
 A. Commercial AM/FM stations K. Radio Station Services
 B. Commercial FM station G. TV Station/Teleprod Facility
 C. Educational AM/FM station H. Consultant/Ind Engineer
 E. Network/Group Owner I. Mfg. Distributor, or Dealer
 J. Other _____
Job Function (check one)
 A. Owner/President G. Sales
 B. General Management H. Programming/News
 C. Engineering J. Promotion
 F. Other _____

Incomplete cards will not be processed. Publisher determines qualification.

Reader Service P14

September 4, 1996 Issue Use Until December 4, 1996

For more FREE information on an advertisement or article in this issue, circle the number below that corresponds with the number under each ad or article. Then fill out the rest of the card and mail it in. We will take care of the rest. For faster service, fax card to (703) 820-3310. Thank you for reading Radio World!

Purchasing Authority (check one)
 1. Recommend 2. Specify 3. Approve

Phone # _____ Fax # _____

001	025	049	073	097	121	145	169	193	217
002	026	050	074	098	122	146	170	194	218
003	027	051	075	099	123	147	171	195	219
004	028	052	076	100	124	148	172	196	220
005	029	053	077	101	125	149	173	197	221
006	030	054	078	102	126	150	174	198	222
007	031	055	079	103	127	151	175	199	223
008	032	056	080	104	128	152	176	200	224
009	033	057	081	105	129	153	177	201	225
010	034	058	082	106	130	154	178	202	226
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014	038	062	086	110	134	158	182	206	230
015	039	063	087	111	135	159	183	207	231
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017	041	065	089	113	137	161	185	209	233
018	042	066	090	114	138	162	186	210	234
019	043	067	091	115	139	163	187	211	
020	044	068	092	116	140	164	188	212	
021	045	069	093	117	141	165	189	213	
022	046	070	094	118	142	166	190	214	
023	047	071	095	119	143	167	191	215	
024	048	072	096	120	144	168	192	216	



Call Simone Mullins, Classified Ad Manager, to reserve space in the next issue. Use your credit card to pay, we now accept VISA and MASTERCARD.

5827 Columbia Pike, 3rd Floor Falls Church, VA 22041 ■ PHONE: 703-998-7600 ■ FAX: 703-998-2966

Select from these categories for best ad positioning:

- Acoustics
- Amplifiers
- Antennas & Towers & Cables
- Audio Production (Other)
- Brokers
- Business Opportunities
- Cart Machines
- CD Players
- Computers

- Consoles
- Disco-Pro Sound Equip.
- Financial Services
- Leasing
- Limiters
- Microphones
- Miscellaneous
- Monitors
- Receivers & Transceivers
- Recorders

- Remote & Microwave Equip.
- Repair Services
- Satellite Equipment
- Software
- Stations
- Stereo Generators
- Tapes, Carts & Reels
- Tax Deductable Equipment

- Test Equipment
- Transmitter/Exciters
- Training Services
- Tubes
- Turntables
- Positions Wanted
- Help Wanted

Classified Advertising Rates Effective January 1, 1996

	1x	3x	6x	12x
1-9 col inch (per inch)	\$65	62	58	52
10-19 col inch (per inch)	59	56	52	47
Distributor Directory	100	95	90	85
Professional Card	70	64	59	53
Classified Line Ad	\$1.95 per word			
Blind Box Ad	\$15 additional			

To compute ad costs: Multiply the number of ad inches (columns x inches) by the desired rate schedule for your per unit cost. Example: a 3" ad at the 1x rate is \$195, at the 3x rate \$186, at the 6x rate \$174, at the 12x rate \$156, etc.

ACTION-GRAM

EQUIPMENT LISTINGS

Radio World's Broadcast Equipment Exchange provides a FREE listing service for radio stations and recording studios only. All other end users will be charged. Simply send your listings to us, following the example below. Please indicate in which category you would like your listing to appear. Mail your listings to the address below. Thank you.

Please print and include all information:

Contact Name _____
 Title _____
 Company/Station _____
 Address _____
 City/State _____
 Zip Code _____
 Telephone _____

I would like to receive or continue receiving Radio World FREE each month. Yes No

Signature _____ Date _____
 Please check only one entry for each category:

I. Type of Firm

D. Combination AM/FM station F. Recording Studio
 A. Commercial AM station K. Radio Station Services
 B. Commercial FM station G. TV station/teleprod facility
 C. Educational FM station H. Consultant/ind engineer
 E. Network/group owner I. Mfg. distributor or dealer
 J. Other _____

II. Job Function

A. Ownership G. Sales
 B. General management E. News operations
 C. Engineering F. Other (specify) _____
 D. Programming/production _____

Brokers, dealers, manufacturers and other organizations who are not legitimate end users can participate in the Broadcast Equipment Exchange on a paid basis. Line ad listings & display advertising are available on a per word or per inch basis.

WTS WTB Category: _____
 Make: _____ Model: _____
 Brief Description: _____
 Price: _____

WTS WTB Category: _____
 Make: _____ Model: _____
 Brief Description: _____
 Price: _____

WTS WTB Category: _____
 Make: _____ Model: _____
 Brief Description: _____
 Price: _____

WTS WTB Category: _____
 Make: _____ Model: _____
 Brief Description: _____
 Price: _____

WTS WTB Category: _____
 Make: _____ Model: _____
 Brief Description: _____
 Price: _____

WTS WTB Category: _____
 Make: _____ Model: _____
 Brief Description: _____
 Price: _____

WTS WTB Category: _____
 Make: _____ Model: _____
 Brief Description: _____
 Price: _____

*Closing for listings is every other Friday for the next month's issue. All listings are run for 2 issues unless pressed for space or otherwise notified by listee.
Broadcast Equipment Exchange
 PO BOX 1214, Falls Church, VA 22041 • Tel: 800-336-3045 • Fax: 703-998-2966

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This listing is provided for the convenience of our readers. Radio World assumes no liability for inaccuracy.

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 Chief Operating OfficerCarmel King
 Production DirectorLisa Stafford
 Production ManagerLisa Lyons
 Publication ManagerHeather Heebner
 Classified/Showcase Production Coordinator.....Vicky Baron

Ad Traffic CoordinatorKathy Jackson
 Production AssistantsKris Willey, James Cornett
 Ad Coordination ManagerSimone Mullins
 Circulation DirectorEleya Finch
 Circulation ManagerRobert Green
 Accounts Receivable.....Steve Berto

Advertising Sales Representatives

U.S. East: Skip Tash703-998-7600 Fax: 703-998-2966
 U.S. West: Dale Tucker916-721-3410 Fax: 916-729-0810
 U.S. Midwest: Sandra Harvey-Coleman317-966-0669 Fax: 317-966-3289
 International: Stevan B. Dana+1-703-998-7600 Fax: +1-703-998-2966
 Latin America: Alan Carter+1-703-998-7600 ext 111 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

Free Subscriptions are available upon request to professional broadcasting and audiovisual equipment users. For address changes, send current and new address to RW a month in advance at P.O. Box 1214, Falls Church, VA 22041. Unsolicited manuscripts are welcomed for review; send to the attention of the appropriate editor.



Where In The World Are You?

Reach radio professionals worldwide by advertising in Radio World's international edition. Call for more information.
800-336-3045
Ext.154

FROM THE LARGEST FACILITY
TO
THE SMALLEST STATION
PEOPLE KNOW
THE
AUDITRONICS 210 SERIES



PEOPLE KNOW:

- ◆ classic style when they see it
- ◆ sturdy reliability when they feel it
- ◆ convenience when they operate it
- ◆ support when they need it
- ◆ affordability when they buy it
- ◆ longevity when they use it year after year
- ◆ thousands are in use right now

AND PEOPLE GET THE BEST AUDIO FROM:

AUDITRONICS

3750 Old Getwell Road, Memphis, TN 38118 (901)362-1350 Fax: (901)362-8629

GSA #GS-03F-4032B

Some Countries Have It ALL!




WSIX - Nashville, Tennessee "Country Music Station of the Year"

A-500 Studio Furniture delivered March 1993
A-500 Console S/N 20789 delivered April 1993
A-500 Console S/N 20792 delivered April 1993
A-6000 Studio Furniture delivered March 1995
A-6000 Console S/N 22536 delivered March 1995
R-16 Console S/N 22557 delivered March 1995
SP-5 Console S/N 22593 delivered April 1995

1995 Academy of Country Music Award
1995 Marconi Country Music Award
1995 Billboard Country Music Award
1995 Country Music Association Award
1995 Country Music Association SRO Award
1995 Gavin Country Music Award
1996 Gavin Country Music Award
1996 Academy of Country Music Award

Wheatstone Model A-6000 Audio Console shown

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