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# Radio World®

Vol 15 No 8

Radio's Best Read Newspaper

April 24, 1991



## Towering Inferno:

Find out how D.C.'s WNTD got back on the air after being ravaged by fire, p. 10.



Photos by Alan Felsen

# Filings Support Avionics Specs

by Arthur Cole

**WASHINGTON** The FCC should take the lead in establishing minimum standards for air navigation (avionics) receivers to eliminate any interference risk from broadcasters, according to the majority of comments filed on a recently proposed rulemaking.

The submitted reply comments were in response to a December petition for rulemaking submitted by Texas radio consultant John Furr.

Furr asked the FCC to set standards for avionics equipment largely to eliminate third order intermodulation, in which receivers interpret two or three broadcast signals as an additional signal that can interfere with directional finders and

landing equipment.

The FAA has responded to the problem by issuing "Hazard to Air Navigation" notices to radio and TV applications, using what Furr calls "worst-case" standards of avionics equipment. The practice has resulted in denial or alterations of numerous tower applications, particularly those that would broadcast in the high FM frequency range (108 MHz) because of its proximity to avionics spectrum (108-112 MHz).

Broadcasters, however, contend such FAA control of broadcasters would not be necessary if the aviation industry used better quality radio receivers.

## Who is in charge here?

Of the 14 reply comments filed at the Commission, only a joint filing by Aeronautical Radio Inc. (ARI) and the Air Transport Association of America (ATAA) opposed the petition for rulemaking.

The two groups maintained that setting standards for avionics equipment is beyond the FCC's authority under the

(continued on page 3)

# D.C. Station to Test In-Band DAB

by Judith Gross

**WASHINGTON** A top-rated AM-FM combo in the urban Washington market is on its way to becoming the first station to test an in-band DAB system—perhaps the first to put DAB on the air.

Cook Inlet Radio Partners Director of Engineering Tom McGinley has confirmed that executives from his station, including CEO Dan Mason and station GM Ben Hill were scheduled to sit down and work out an agreement with Ron Strother of Strother Communications Inc. by mid-April.

The agreement would allow Strother to test a DAB system over Urban Contemporary WPGC-FM and possibly the all-business WPGC-AM as well.

Strother, who has already filed for FCC permission to test various DAB systems on UHF, MDS and L-band frequencies, is now interested in testing in-band or FM-compatible systems proposed by Gannett-SRI, Kintel (Power Multiplexing), Mercury Digital and possibly Radiotechniques (see related story, this issue).

"I'd like to become the independent test center for all DAB systems being proposed," Strother said. He noted that it is a role one might expect of the NAB, which he said "abdicate" that position when the NAB Radio Board voted to endorse and pursue licensing of the Eureka 147 system in January.

According to McGinley, Strother ap-

proached him about his test idea and it was received favorably by station management. "We're a good choice because we have two transmitter sites, and one of them we control completely," McGinley said.

McGinley said that a test plan would have to ensure that there would be no interference to the station's regular signal, and that a digital signal would most likely be transmitted "at least 20 to 30 dB down." He also said the tests would likely take place at night.

The most likely in-band system for testing would be the one jointly developed by Gannett, Stanford Research Institute and Corporate Computer Systems, dubbed "USA Digital," according to McGinley. Because the system is being evaluated for AMs as well as FM, McGinley said he could foresee testing on WPGC-AM in "Phase II."

McGinley said WPGC is not currently an NAB member, which would remove any possible conflict caused by the NAB's apparent opposition to in-band DAB systems in favor of Eureka, which requires new spectrum.

If the FCC approves Strother's experimental station requests and an agreement between Strother and CIRP is completed, it would provide SCI with the means necessary for the company to test all DAB systems under development.

SCI has asked for two UHF frequencies, one in Boston and one here, to test the Eureka and Stanford Telecom (not

SRI) systems; L-band frequencies to test both as well; and has been offered the use of wireless cable stations (MDS) in the West Virginia area, also to test DAB.

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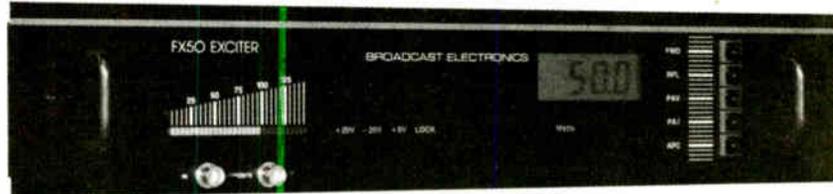
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# EIA Agrees to Examine AM Mark

by John Gatski

**WASHINGTON** The Electronic Industries Association (EIA) has agreed to consider adoption of an AM receiver certification mark, a move the NAB insisted on at its Radio Board meeting in January.

At the January meeting, the NAB asked the EIA to help get receiver manufacturer con-

sensus on adopting a certification mark within 30 days or it would pursue a standard on its own.

The EIA responded by saying it needed more time to consider promoting a certification mark, to which the NAB agreed. The issue will be discussed at the EIA's Audio Division meeting in early April.

The certification mark had appeared to be in limbo until the NAB Radio Board's ultimatum. The effort to get receiver manufacturers to build better AM receivers and tuners has faced numerous obstacles since NAB and EIA first agreed to push a voluntary mark in 1989.

Early in its efforts, a joint NAB/EIA AM receiver commit-

tee had to withdraw its recommended certification trademark proposal, called "IQ," because Bell Atlantic already used the acronym.

Other events that have bogged down a certification mark effort have included an EIA/NAB disagreement over what criteria should be considered for a certification mark.

The main criteria considered for the standard was the proposed National Radio Systems Committee (NRSC) voluntary standard, called "Audio Bandwidth and Distortion Recommendations for AM Broadcast Receivers." The standard eventually was adopted by the NRSC, which is composed of EIA and NAB members, in October 1990.

The standard calls for receivers with 10 kHz bandwidth, at least a 50 Hz to 7.5 kHz frequency response and no more than two percent distortion. The guideline also recommends that manufacturers incorporate circuitry that attenuates the 10 kHz adjacent carrier frequencies by at least 20 dB (NRSC-1 pre-emphasis on) or 30 dB without NRSC-1.

Additional recommendations include an external antenna connection, noise blanking and wide/narrow bandwidth switches for AM receivers.

Snags developed, however, when the NAB also wanted to include a designation for AM stereo (no particular system was recommended). The EIA initially supported the stereo designation, which would have been a separate mark that indicated compliance with the NRSC specification plus stereo, but then decided to oppose it.

Some receiver manufacturers also were unhappy about bandwidth requirements proposed in the standard.

Legislative efforts have failed to help get quality AM receivers. A 1989 congressional bill that would have mandated AM stereo in receivers with FM stereo did not move out of committee.

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# Filings Support Avionics Specs

(continued from page 1)

Communications Act of 1934 or any ensuing amendments.

"The Communications Act does not confer upon the FCC general authority to regulate receivers directly," the comment said. "(The act does) confer authority to regulate transmitters, but not receivers."

The comments added that the FCC has been granted specific power to regulate receivers, such as those for television and maritime uses, but only by direct authority from Congress.

"With these narrow exceptions, the FCC's authority over receivers is limited to indirect regulation," the groups stated. "The Commission's assignments are based upon a set of assumed receiver characteristics; receivers not meeting those characteristics are not protected."

## Foreign interference

The groups also noted that aviation receiver standards will fall under the International Civil Aviation Organization's (ICAO) Annex 10 to the Convention on International Civil Aviation, to which the U.S. is bound by treaty. The convention calls for avionics equipment to meet interference standards by 1998.

"The FCC should adopt FM station criteria that will protect international civil aviation operating in accordance with ICAO Annex 10," the comments said. "The FCC should not unilaterally adopt

standards or criteria for aircraft receivers that are more stringent than those internationally agreed upon, because such an action could result in interference to international aircraft in violation of this treaty."

Broadcasters, however, unanimously supported the notion that the FCC should seek to upgrade avionics receivers, rather than let outdated technology hamper the broadcast industry.

"The cost to install filters in these inferior avionics receivers, and to manufacture receivers with reduced interference susceptibility, are quite minimal, especially when viewed in comparison to the alternative costs to communications companies," according to the NAB filing.

"Moreover, the record established in the FAA proceeding already provides ample evidence that the standards being employed by the FCC to predict interference ... are far more stringent than necessary," the filing added.

## Passing the buck

ARI and the ATAA said radio upgrade would require the replacement of two \$10,000 to \$15,000 receivers per aircraft, estimated at \$80 million to \$120 million for an industry-wide upgrade.

In his petition, Furr said the airline industry would be impacted minimally because most companies no longer use receivers that are susceptible to broadcast interference. He said broadcasters

are being seriously affected by FAA actions, spending up to \$150,000 in legal and consulting fees to gain a tower construction permit.

Broadcasters also disputed the contention that setting avionics standards does not fall within the FCC's mandate under the Communications Act, which orders the FCC to manage spectrum.

"The regulation of radio frequency emission and reception devices, and the establishment of selectivity and interference standards for such devices ... cannot be properly performed by any other agency without detracting from the Commission's ability to properly manage spectrum," said the Association for Maximum Service Television.

Broadcasters also pointed out that Congress has directed the FCC to set rules and standards to comply with international treaties, including Annex 10 of the ICAO.

"The Commission has the authority to adopt rules and regulations necessary to carry out the provisions of international treaties or conventions relating to the use of radio," National Public Radio wrote. "Commission standards for improved receiver immunity, including interim measures such as mandatory filters, would largely resolve the

few instances of documented interference between FM broadcasters on the upper FM frequencies and air navigation operations."

## Attacking the FAA

Broadcasters also took the opportunity to chastise the FAA for its attempts to expand its authority over broadcast regulations by seeking to regulate electromagnetic interference (EMI) policies.

"The FAA is attempting to preempt the field," Fisher Broadcasting Inc said. "The FAA's (proposed rulemaking) proposes to adopt changes ... without public comment and without FCC coordination. The FAA's current standards and proposed changes demonstrates its unwillingness to balance the needs of broadcasters ... with the need to protect navigable airspace from interference."

The Utilities Telecommunications Council commented: "The proposed rules are beyond the FAA's statutory authority. They set no definite standards for the review of radio license applications, and they would vest too much discretion in the FAA to override legitimate FCC licensing decisions."

CBS said the FAA EMI proposal is the wrong approach. "The FAA's drastic proposals were misguided precisely because they failed to consider improvements to air navigation receivers, such as increased shielding of aviation receivers, as a remedy for any potential interference," the network commented.

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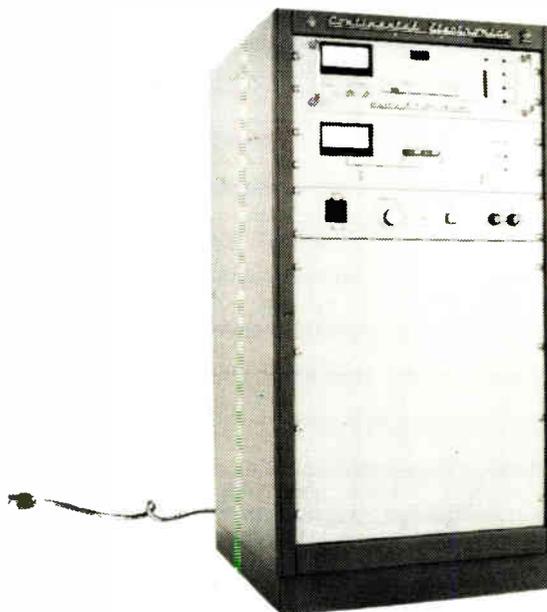
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# Don't Wake Me 'Til It's Over

by Judith Gross

**FALLS CHURCH, Va.** Hard to believe after the many weeks of buildup, but the NAB show is history for another year.



Now, of course you're gonna hear all about the latest and hottest products that were there; they'll be spotlighted in upcoming issues, so keep turning these pages.

The fact is that as my fingers fly across this keyboard, I haven't even left to fly out to Vegas yet. But I can still tell you the three related things that are uppermost in my mind as I return:

My feet hurt. I need to catch up on sleep. And my feet really hurt.

So I guess I'll just ease down into that recliner, pop open a frosty can (of diet cola, what did you think?) and catch up on what's been happening in the rest of the industry, in a potpourri sort of way.

Thought maybe you didn't get enough of the show (either reading about it or being there), so I've included some pix here. Whoops! Guess we've wandered into a time warp, circa 1969-1970. Unhealthy cigarette smoking on the exhibit floor, and the visitor doesn't look too happy with the picture-taker, either. And is that the McMartin booth in the corner?

Then there are the Tapecaster models, in the mod fashion of the '60s. No, I'm not referring to young women and their attire, which is back in style in the '90s anyway, but to the cart machines on display.

I remember those Tapecasters. My first newscasts, I almost couldn't figure out how they worked. Good thing

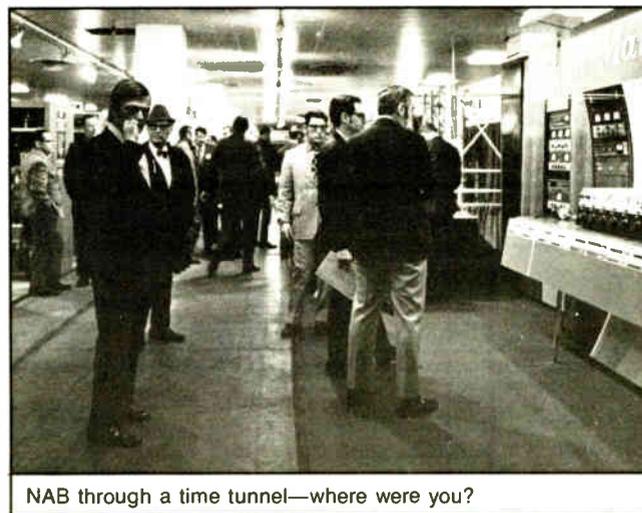
the FCC used to require all stations to have a CE on hand. I'da been lost. Ah, the good old days.

But back to the present. Did you ever stop to consider the number of times you're listening to your favorite station not in stereo, but in mono? Yeah, all this talk about how digital is so hot, but think about it. If you wake up to a clock radio (like I do)—betcha it's mono.

If you're listening to most AM stations—mono as well (unfortunately). Then you turn on your FM music station in the car and say, "Aha, JG, my car is a brand new BMW with the hottest sound system; I'm listening to stereo."

Wrong again, decibel-breath. If you're a certain distance from the transmitter and the stereo separation falls below, oh, say maybe 35 dB, you too are listening to Madonna or Dolly in mono, even if your stereo light is glowing happily back at you from the dashboard. That's "blending."

So it has to make you wonder why



NAB through a time tunnel—where were you?

some dazzling record producer who gets hooked on the idea of 3-D sound but desperately wants that hot new group to have a hit on the airwaves wouldn't stop to consider what you and I already know.

Yeah, they're forward-thinking and

all, and we know that mono is dead and stereo is sizzling, but if it doesn't sound good on radio, how are you gonna sell the CD? And word from the front is that the 3-D stuff can affect mono if mixing engineers aren't careful. Hope they're listening.

I won't mention any names or anything, but one savvy engineer who is a whiz about processing recently went to a station noted for overdoing it and decided to turn off all the black processing boxes just to see what the music sounded like without any goop.

I won't mention any call letters either, but it was in a market where if you don't add a gazillion processing boxes you don't survive.

Anyway, guess what he found? He measured the dynamic range emanating from the pristine signal and found out that there wasn't any. Or hardly any. It ain't the processing. In this case, it was the music (or what some stations are calling music). Yes. Garbage in ... well, you know the rest.

As for DAB, there are now four—count 'em, four—in-band systems being proposed. There's Gannett's (with SRI), Kintel's (Power Multiplexing), Mercury Digital and now Ted Schober has shared-spectrum spreading (see related article, this issue).

And these systems all have such great names. I mean we already have Eureka, or "I've found it!" Gannett's was "Project Acorn," but from that acorn "USA Digital" has grown. MFM and PowerMux sound imposing enough. But Ted is dubbing his system "American Digital Radio." Well, I guess DAB is nothing if not patriotic.

And in the never-ending quest for spectrum, the FCC's chief e

Tom Stanley, recently had a couple of interesting tidbits at a brown bag lunch devoted mostly to personal communications.

No, UHF spectrum is not completely out for DAB, but nobody seems to be



Sixties team: Polka dots and endless-loop carts.

in love with it there, either. Then he asked why in-band systems weren't being looked at more closely, why some quarters aren't being more optimistic about them.

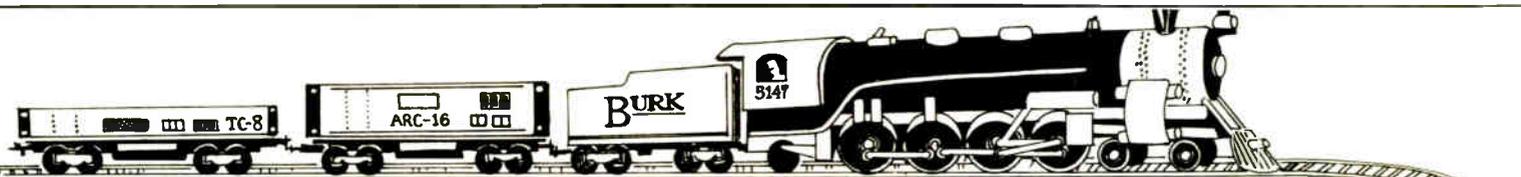
Dr. Stanley also wondered aloud why we need digital sound, then said he realized his favorite vinyl was disappearing from record stores. Guess we'll just have to start accenting the second syllable of "record," Doc.

As for personal communications, or PC, can't you just see a time when we'll all be walking around with these compact backpacks containing our very own CD or DAT player/radio plus earphones, portable phone, personal portable laptop, printer and fax machine in one neat little package?

Did I leave anything out? Oh, how about a retractable automatic umbrella that senses when it rains? We'll call it: Personal Umbrella/Communications Know-it-all, or PUCK. Think it'll catch on?

Heard a juicy tidbit? Spill your guts to Earwaves by faxing JG at 703-998-2966 or writing to P.O. Box 1214, Falls Church, VA 22044.

Photos courtesy of NAB

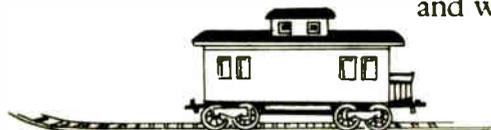


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### A modest AM proposal

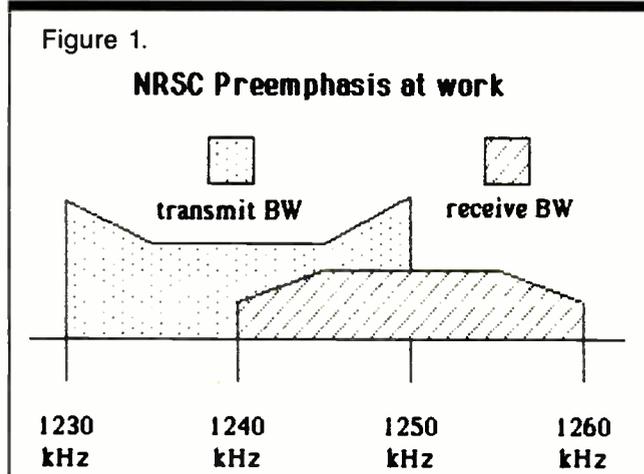
Dear RW,

I have finally read enough whining letters about AM to prompt me to write. I believe the situation is worse than these correspondents suppose, and truly major changes will need to occur to "fix" anything. Even worse, I do not

counterproductive when viewed in the light of reason.

Any discussion of the revitalization of AM must focus on its real problems. First, what service is it possible to provide via AM that the consumer might want? Second, in what role will consumers accept AM broadcasting? And third, what are the technical changes we might be willing to make?

My opinion is that the changes being considered are not responsive to the real technical problems and market acceptance factors, and that different changes will be necessary to salvage the AM band. The sooner we realize what is possible and what is necessary, the faster we can help. The sooner we realize what is impossible,



see any discussion of the real issues involved, indicating that those in a position to do something do not understand the fundamental problems. In fact, most current suggestions seem

the sooner we can realize the possible. It is my belief that the widespread availability of FM and personal music sources has precluded market acceptance for AM as a primary music medium, regardless of the changes we might make.

It is widely reported that broadcasters believe selection of a stereo AM standard, and perhaps FCC action requiring stereo broadcasting, would revitalize the band. Likewise, many advocate wideband and/or stereo receivers, even if legislation is required to force their manufacture.

The wideband receiver issue is one that is not being evaluated realistically or with regard to history. Just how did AM radios get so "bad" in the first place? It seems the complainers feel manufacturers whimsically decided to produce lousy radios with limited bandwidth to punish the broadcast industry, or for some nefarious corporate goal.

In fact, the limited bandwidth trend was demanded by consumers (often through manufacturers' market testing procedures) as interfacing stations and man-made noise sources proliferated. Listeners found hearing only half the program preferable to hearing all the garbage. There are simply too many stations on the air, and too much noise, for wideband AM reception to be our primary strategy.

Although a lifetime of AM listening has taught me that adjacent channel interference is the most serious non-noise problem, little is said about it even today. The AM improvement comments summarized in the press discuss alternate channel, but not adjacent channel interference. Indeed, the vaunted NRSC pre-emphasis has made matters worse instead of better. Now adjacent-channel stations are not only allowed but re-

The dispute between the FAA and the FCC regarding interference to air navigation equipment proves that some problems are best solved cooperatively. So far, however, each agency has attempted to place the blame solely on the other. And taxpayers are footing the bill.

The FAA has staked out an emotional advantage over the FCC in the current dispute: public safety. Interference to avionics equipment can cause problems for aircraft—particularly upon landing, the agency has said. Hence, the FAA has proposed increasing its control over FM new construction and upgrades.

Broadcasters, however, maintain that no airplane accidents have been proven to have resulted from interference caused by radio broadcasts. They argue that the FAA is exceeding its authority, when the problem may actually lie in the avionics receivers themselves.

## A Taxing Dispute

Not surprisingly, a petition before the FCC to establish specifications for avionics receivers has been supported in broadcasters' comments. Pilots, however, suggest that the FCC would be operating outside its authority to set such receiver standards.

While this proceeding may provide the FCC with a stalling tactic to prevent the FAA from acting on its own rulemaking, it does nothing to answer the key question: Is there, in fact, a problem? To arrive at a conclusive answer, it seems logical that the FAA and FCC must start working together.

What these agencies' independent proposals and counter-proposals do is simply perpetuate a bureaucratic process. Taxpayer dollars are being spent to have the FAA and FCC maneuver around each other, prolonging the process while getting no closer to a real answer.

So far, informal discussions between the FAA and the FCC have progressed at a snail's pace. It seems clear that informal meetings will not work.

Broadcasters, as taxpayers, have a course of action. They can voice their dissatisfaction with the process to their congressmen. They can write to the transportation and communications subcommittees of the House and the Senate, and request some mediation of the dispute.

Ultimately, they can even write to John Sununu, the president's chief of staff. Perhaps it is time that the head of the executive branch of our government was made more aware of what's going on.

Perhaps the White House can get the FAA and the FCC to work together. Then the claims of interference to avionics can be settled in a manner that would be equitable to all concerned.

—RW

quired to increase their interference to your lower frequency program content (under 5 kHz). (See Figure 1.)

The only true solution to the adjacent channel problem is for all broadcasters to settle for a clean, interference-free 5 kHz program bandwidth (see Figure 2). Or, one might allow stations with 10 kHz audio bandwidth on 20 kHz channels (or

ize this, and program for lower-fidelity formats with less music, for smaller, more loyal market segments, or for long-distance coverage.

So, what are my bright ideas? I believe we should limit emissions to  $\pm 5$  kHz (pre-emphasizing the top octave desired), and move toward fewer, higher-power stations with better co-channel protection. A forever dark policy might be a good first step.

Requiring simpler, truly standardized DA installations (four towers maximum, for example) will generally improve the sound of stations on the band and the funny coverage found on AM (obviously fewer stations could be authorized).

I would like to see a maximum negative modulation limit of 95 percent or so, to eliminate splatter and ease synchronous detection. It will lessen co-channel stations use of frequency-locked carriers, for example, by derivation from WWV. We should allow but not require stereo operation with the system of the broadcasters choice.

In summary, there are too many stations on the band attempting to compete against other media the consumer clearly prefers for music delivery. In doing so, they interfere with each other to the point that the utility of the service is seriously compromised. Only by preventing this self-pollution of the medium can we hope to salvage its utility. We can either accept far fewer high-fidelity stations—which probably would still not be able to compete against FM and other media for market reasons—or reduce the number of stations moderately and limit their fidelity.

Ironically, this limitation of the transmitted fidelity would allow a dramatic increase in the received fidelity compared to the present situation.

Don Stepka  
Sound Engineering  
Rochester, N.Y.

## Radio World

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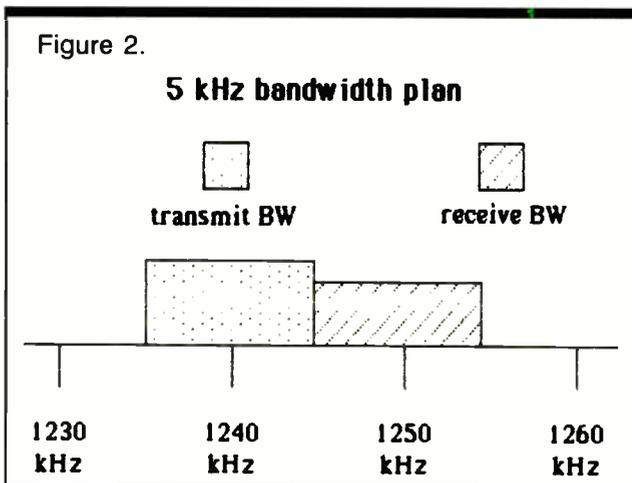
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Radio World  
May 8, 1991



20 kHz audio on 40 kHz channels), removing half or three-quarters of our present channel from use.

As for stereo, a straw poll of about 30 acquaintances revealed three who have listened to AM at least once in the last decade. One of these is also a broadcasting consultant.

Of the remaining two, one listens regularly to a station which promotes its stereo broadcasting. He is unaware that AM is broadcast in stereo and does not care. The other believes herself to be listening in stereo on her mono receiver. So far as I can tell, there is no market demand for stereo AM. Indeed, there appears to be very little market demand for AM as a primary means of music delivery.

What AM is good at is long distance, medium-fidelity broadcasting. Most of today's successful AM broadcasters real-

# DAB Proponent Wants Freeze

by Judith Gross

**HADDON HEIGHTS, N.J.** A developer of an in-band DAB system has asked the FCC to put a freeze on new FM stations and translators to keep the band open for digital allocations.

Engineering consultant Ted Schober, whose firm Radiotechniques has been working on an in-band digital system, petitioned the Commission in late March asking for the freeze.

If granted, the action would stop new translator applications, new FM allocations and FM upgrades, and would limit changes of city of license for a specified list of FM stations. It would also put a freeze on FM educational applications and maintain a current freeze on low power TV.

## Shared spectrum spreading

Schober said he wants to ensure there will be enough FM spectrum for an in-band system he is dubbing "American Digital Radio." He said the system uses shared spectrum spreading to place a digital signal in the spaces between current FM stations.

In the system, the RF signal of two transmitters is timed on a coding algorithm so they can share spectrum. Unlike two other in-band DAB systems being proposed (Gannett-SRI and Power Multiplexing) it does not "piggyback" a digital signal on an FM carrier.

Shared spectrum spreading can cluster three to ten stations on a single transmitter, according to Schober. The digital signal would require 400 kHz of spectrum—twice as much as existing analog FM. Schober said the system also provides multipath immunity, but that in crowded markets there may not be enough spectrum to give all the benefits of the system from the outset.

Schober also noted there is not enough spectrum in between current FM stations to accommodate every FM and AM station in the U.S. initially, either. Placing digital signals on unused UHF-TV spectrum and asking for the freeze on FMs are his solutions to the scarcity of spectrum.

## All in the roll-out

He outlined a roll-out plan for his system that would have an initial group of pioneer DAB stations simulcasting for several years.

Once receiver penetration approaches a critical point, Schober said that licensees could be persuaded to give up their analog signals and that would open up enough spectrum for other licensees to begin broadcasting DAB. "It would also provide enough spectrum for full multipath immunity," he said.

If the first DAB "pioneers" need incentive to give up current spectrum, Schober said they could be granted an additional DAB license or that one station might even become "a common car-

rier," providing DAB spectrum to several licensees.

## Readying the system

Schober, along with consultant Bill Spurlin from Christian Science Monitor Radio, are looking at the ASPEC compression algorithm for the American Digital Radio system.

Schober said that even though MUSI-CAM beat out ASPEC at last year's ISO

tests, he's looking down the road about two years to "when compression goes down as low as 56 kbps."

He believes that no other DAB system will be ready to go on-air until that time. He also said that he may be able to get a U.S. exclusive for the ASPEC system.

Schober said he hopes to eventually accommodate all FM and AM stations with his system. He is still putting together a timetable for American Digital Radio, but hopes to have something to show at the fall conventions (Radio 1991 and SBE) with on-air testing in early 1992 and a full system ready for next year's NAB convention.

## CD Recorder Shown

**LAS VEGAS** Studer Revox joined the ranks of other manufacturers showing CD recorders at this year's NAB convention here.

The Studer D740 CD-R features Write Once optical media and is compatible with any standard format professional or consumer CD player.

The Studer CD recorder features a built-in PQ Editor, which will automatically generate a table of contents including track numbers and running times.

According to Studer, the company also plans to market and distribute its own brand of Professional CD Write Once Discs, to be stocked at all Studer Revox regional offices. First deliveries of the D740 are scheduled for late

summer 1991.

Other manufacturers who introduced CD recorders at the NAB included Denon and Yamaha. Kenwood



The Studer D740

and Yamaha showed prototypes of their own recordable CD systems at the Consumer Electronics Show (CES) in January.

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# Mexico Shops for DAB System

by Alan Carter

**MEXICO CITY** Mexican broadcasters are beginning their search for a digital audio broadcasting (DAB) standard in their country.

Commercial broadcasters representing the Mexican broadcasting authority, Camara Nacional de la Industria de la Radio y Television (CIRT), met with NAB

representatives in March during a trip to Washington D.C. The NAB backs the European-developed Eureka 147 transmission system and supports a single standard for Central and North America.

The trip followed a conference held in Mexico by the International Telecommunications Union (ITU) on DAB and coincides with studies by the Secretaria de Comunicaciones Transportes (SCT), the

governmental body that oversees spectrum issues.

## Agreements pending

The CIRT delegation's fact finding trip to Washington resulted in agreement on several NAB positions, according to CIRT General Manager Cesar Hernandez.

Hernandez said CIRT would support terrestrial delivery as the primary transmission pattern for DAB, and satellite would be secondary.

CIRT also is interested in testing DAB at 1500 MHz (L-band) and would favor adoption of a single standard for Mexico, the U.S. and Canada because of border stations and trade agreements, Hernandez explained.

NAB officials discussed the sharing of profits with CIRT from a potential licensing agreement it is negotiating with Eureka developers, but nothing was finalized.

NAB Operations Executive Vice President John Abel called the discussions with CIRT promising.

## United front

Abel said officials from the U.S., Mexico and Canada would meet in Las Vegas to discuss DAB.

NAB previously met with officials from the Canadian Association of Broadcasters (CAB), including President Michael McCabe and CAB Senior Radio Vice President Michel Tremblay, on sharing profits from any DAB licensing.

For their part, the Canadians are pleased by NAB's offer. But that is not their main concern. What is important, according to Tremblay, is the fact that NAB is so squarely behind digital radio; something that was not the case before last summer's tests.

Besides the Mexican and Canada connections, the NAB's attempt to ensure a single DAB standard for North and Central America has headed further south to Brazil and Argentina.

Abel said NAB would propose that the U.S. would not oppose satellite delivery as a primary source for DAB in South America if those countries would not oppose primary terrestrial delivery in Central and North America. On an international basis, the areas are considered one region for spectrum debates such as those upcoming at the 1992 World Administrative Radio Conference (WARC).

NAB will support the proposal at the Inter-American Broadcasters Association meeting set in Mexico in May, according to Abel.

♦ ♦ ♦

Canadian correspondent James Careless contributed to this report.

# RadioSat Proceeds

by Judith Gross

**LONG BEACH, Calif.** A satellite company hoping to provide a DAB service on the mobile satellite band is proceeding with its plans despite a court ruling which knocked down American Mobile Satellite Corporation (AMSC).

In March, a federal appeals court told the FCC it must rethink a 1989 decision setting up AMSC as a consortium of eight satellite companies vying to provide mobile satellite services.

Each of the eight had placed \$5 million on deposit to participate in the consortium, which had planned a 1994 launch of a satellite currently under construction by Hughes Aircraft, one of the consortium members.

Radio Satellite Corp. (RadioSat), which last May petitioned the FCC to begin a DAB-like service on the mobile satellite band, had been planning to use that AMSC satellite.

Now, Gary Noreen, CEO of RadioSat and also president of Transit Communications, one of the stockholders in AMSC, has said he will proceed with plans, launching his service first on Telesat, a Canadian satellite scheduled for launch in early 1994.

"In fact, we always planned on going up on Telesat first," Noreen noted. "The satellites are identical from our standpoint."

Noreen said the coverage of Telesat, which will be launched by Canadian company TMI (Telesat Mobile Inc.), is equivalent to the coverage planned for AMSC's satellite.

The federal appeals court ruling may delay AMSC's plans for two to five years.

Noreen said he anticipated the court's action. Although as an AMSC stockholder he's "personally disappointed," he sees no reason to change RadioSat's timetable.

"We're not seeing it as a big problem," he said. "The satellite will be there, and it will be available to us. Our position has always been we're going to use what's available at the best cost," Noreen said.

He noted that TMI has expressed interest in his planned service, and that he may be required to operate from a Canadian subsidiary of his company. Other than that, he does not foresee any restrictions in offering his service on a non-U.S. satellite.

RadioSat has asked the FCC for authority to establish a direct-to-receiver audio service that would include DAB but may not be CD-quality.

Noreen has already shown miniature car antennas for receiving his service and has talked with broadcasters about providing satellite transmission of their stations for "regional" or "superstation" coverage.

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# FCC Ponders STL Rulemaking

by John Gatski

**WASHINGTON** The FCC continues to wrestle with a proposed congested area definition for operation of television studio-to-transmitter links (STLs), a decision that ultimately will affect aural STLs.

When approved, docket 90-500 finally will enact a definition that requires TV STL users to use appropriate transmitting antennas in congested and non-congested areas. FCC officials said that once the TV STL definition is established, it will enact aural STL guidelines.

The Society of Broadcast Engineers (SBE) proposed both TV STL and aural

STL congested area rulemakings in early 1990, but the Commission decided to act upon the TV ruling first.

The FCC staff, however, is not too keen on the SBE's proposal in its original form. One FCC official said it could create a bureaucratic headache for stations if adopted as-is.

"It seems unduly burdensome and cumbersome," FCC Assistant Mass Media Bureau Chief William Hassinger said. "I think our preference is to go with a decision that is more straightforward and simple."

Based on the SBE TV STL proposal, congested areas would be defined as

those listed in the list of Standard Metropolitan Statistical Areas (SMSA). Congested areas would be classified as Category A and, unless otherwise exempted, would require larger antennas than non-congested area STLs, known as Category B.

## Troublesome exceptions

The SBE's proposal becomes complicated in trying to accommodate exceptions, Hassinger said.

According to SBE, most exemptions contained in the TV STL ruling also would apply to aural STLs, including a multi-tier "safety net." One exception option that applies only to TV and not to aural STLs exempts 62 SMSAs as Category A because the TV STL bands are not as crowded in those areas.

That exemption, however should not apply to aural STLs because there are more radio STLs in those areas, according to the SBE.

Further exemptions that would apply to both TV and aural users include a proposal to exclude stations in areas where there is less than 70 percent channel loading in the STL band in their area. Another exception would allow Category B STLs to remain so if a local frequency coordinating committee, such as SBE's, determines that an upgrade is not warranted.

The SBE believes the last option would ensure that broadcasters in "outlying areas of a very large SMSA boundary

could be effectively accommodated."

Other SBE proposed exemptions applicable to aural STLs include a structural exemption that allows a station to continue using a Category B antenna in a Category A area if the tower is determined to be unsuitable for larger antenna upgrade.

## Tower moves not desired

CapCities/ABC expressed concern about the congested area definition because it feared that upgrading from a Category B to a Category A antenna on a heavily loaded tower would require a prohibitively expensive relocation.

SBE, however, said the structural exemption would eliminate that unnecessary expense.

In response to other docket 90-500 comments, SBE said that most can be satisfactorily addressed by the proposal's safety net.

Another complicating factor facing the TV STL rulemaking is the deadline for compliance. A 1981 rule required TV STL users in congested areas to utilize spectrum-efficient STL antennas by October 1991. That deadline, however, was enacted with the goal of having a specific definition adopted long before the deadline came about.

The FCC may extend the deadline to allow stations time to comply with the new ruling. Hassinger said the FCC does not like to alter deadlines, but it may consider it because the congested area definition decision is so late.

The SBE believes only a two to three year grandfather period should be enacted whenever an aural STL congested area definition is approved.

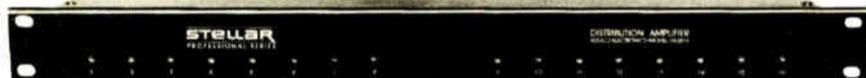
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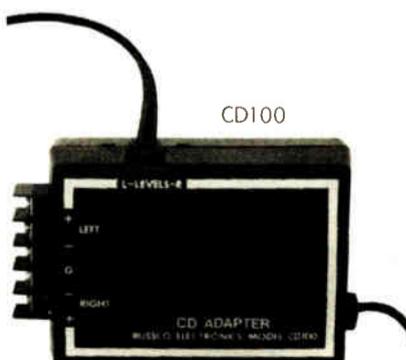
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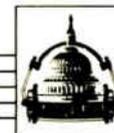
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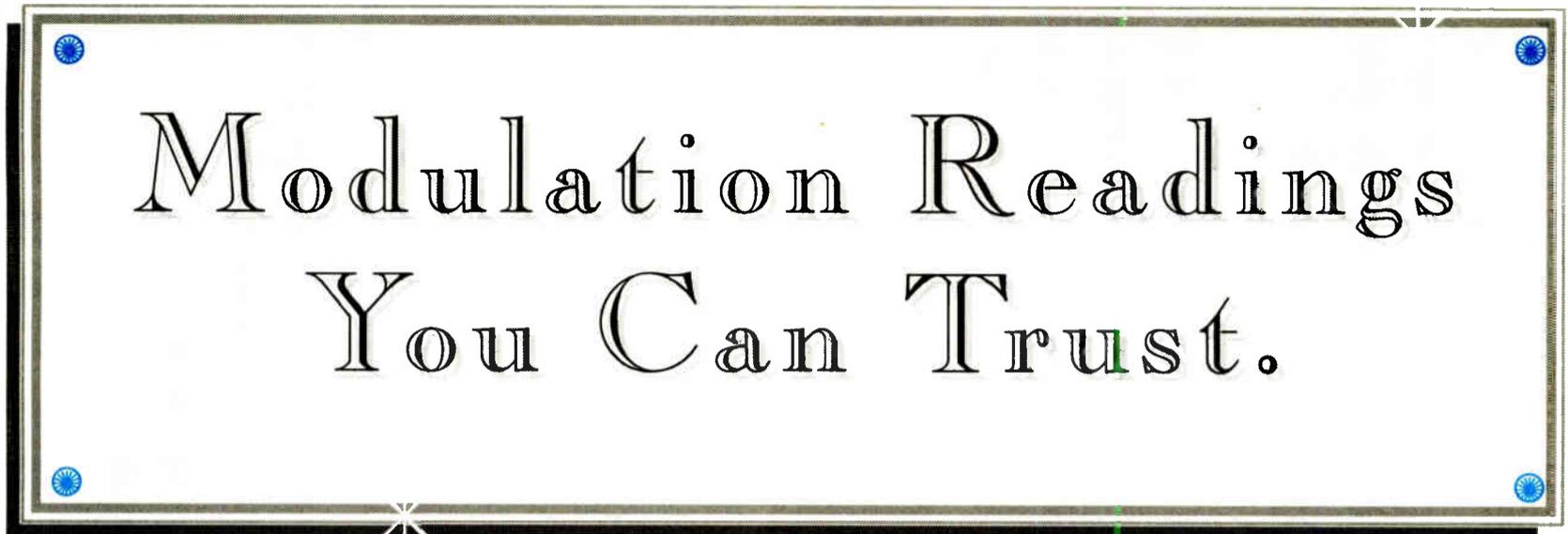
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World Radio History

# Station Blaze Brings Out Samaritan Ethic

by Charles Taylor

**WASHINGTON** It was a heated discussion that recently predominated the Society of Broadcast Engineers (SBE) monthly meeting here.

The main topic was the late winter blaze that broke out in the World Building in Silver Spring, Md., at 3 a.m. The fire gutted the broadcast studios of WNTR-AM, the flagship station for Pat Robertson's talk network. It also caused severe smoke damage to WGAY-FM/WWRC-AM, also in the building.

While the tragedy resulted in as much as a million dollars in equipment and spot losses between the stations, the teamwork demonstrated by the local broadcasting community in putting the stations back together at least made the best of a major misfortune.

According to Tom McGinley, the Washington-based director of engineering for Cook Inlet Partners and one of the primary volunteers who aided the stations, "This kind of thing happens in this business. I've been through several other studio transmitter fires. There's an unwritten code that when a guy is down and burned out, you do what you can to help him out. The fact that he's a competitor isn't important."

The early morning fire was discovered

by WWRC talk radio control board operator Mike Kelley.

"He thought he smelled something, like a coffee machine, and went into the area in the station newsroom where it is," WGAY CE Marty Sacks said. "When he saw it wasn't the coffee machine, he looked out the window and saw an orange glow, which came from the flames coming up from the floor below."

## Down the hall

Kelley ran down the hall to the FM operator, called 911 and the pair raced out of the building.

Ironically, the county fire department happens to have a station next door to the office building. Within minutes, a hose was run from the station to the corridors of the burning structure.

Sacks was quickly notified, making his usual 20-minute drive to the station in 10 minutes. "If the police had tried to pull me over, I'm not sure I would have stopped. I was going 85 (mph) all the way," he said.

"I got there and saw flames coming out of the seventh floor. The fire department had 25 or 30 pieces of equipment working on it," he said.

Fortunately, as part of an emergency plan governed by station owners Greater

(continued on page 12)



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# RDS Recommended

by John Gatski

**WASHINGTON** An NRSC subcommittee has decided to draft guidelines recommending the European-based Radio Data System (RDS) as the U.S. broadcast standard, a move that could have stations broadcasting with the subcarrier as early as summer.

The NRSC subcommittee decided on the 57 kHz RDS subcarrier system because it is further along than other system proposals submitted for evaluation, according to NAB Coordinator Stan Salek.

"It's conceivable that a draft U.S. RBDS standard could be sent to the full NRSC by the June 4 meeting at CES (the Consumer Electronics Show) in Chicago," Salek said. "There could be RDS stations on the air in a matter of months after the standard is adopted."

In evaluating the systems, the NRSC has altered the RDS logo for U.S. purposes, calling it Radio Broadcast Data Systems (RBDS). The NRSC, the NAB and other proponents believe it holds promise for displaying station call letters, traffic alerts, emergency alerts, text message displays and automatic format selection.

The European-based RDS system has been heavily promoted by Sage Broadcasting, now in partnership with Delco, for more than a year. Much of the U.S. version would be based on the European CENELEC RDS specifications.

Sage has proposed program information code exceptions that depart from CENELEC. They include codes to ensure that a receiver can select the different frequencies of two stations broadcasting the same programming, codes for stations with three call letter IDs, and special codes for nationally-linked stations carrying different call letters, like National Public Radio's affiliates.

Sage also supports replacing the current Emergency Broadcast Systems (EBS) with an RDS-based system.

A U.S. RBDS standard also will include compatibility with the Cue Paging system, now located on about 250 broadcast stations towers, Salek said.

The incorporation of Cue Paging technology into the standard is significant, he noted, because the 250 stations using it may be able to convert to the RBDS system quickly with just a minimal investment of new software.

Several receiver manufacturers already produce RDS receivers including Blaupunkt, JVC, Ford, Grundig and Denon.

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World Radio History

# Good Samaritans Aid Blaze Victim

(continued from page 10)

Media Inc., both WGAY and WWRC already were wired to have prerecorded tapes to begin at their respective transmitter sites in the event of five minutes of dead air. Thus, as the studios smoked, for listeners, the show went on.

Then they watched. And waited.

## Not actually burned

Once the flames were dashed, Sacks searched for the proper authority who could escort him through the studio. While the seventh floor studios of WNTR were a total loss, the ninth floor—where WGAY and WWRC are located—had not actually burned.

In the final analysis, the station was fortunate, he contended. "The only real damage other than smoke and soot were holes the fire department had blasted into the walls with locked doors where they'd checked for flames. I also saw parts of the AM newsroom where heat fatigue had cracked the glass. The fire also burned a little bit of the cloth blinds. It shows how close it really was."

While Sacks and the fire official were surveying the damage, a voice came over the fireman's walkie-talkie, he recalled. The building had been condemned after damage was located in concrete reinforcing bars.

Realizing this could be his last visit for

a while, Sacks grabbed a cardboard box and loaded it with about 40 reels of music. He then contacted competitor WKYS's GM Skip Finley, with whom the station had a pre-arranged agreement to borrow studio space in the event of such an emergency. In the meantime, by 6 a.m., the AM side was able to hook up to Baltimore's American Radio Network as the engineers scrambled to set up a makeshift studio at WKYS.

"At that point, we had some sort of live programming on the AM, and continued with live (Persian) Gulf updates, so we had everything but commercials until Monday morning," Sacks said.

On Wednesday, the station managed

to get back into the building and retrieve its commercial load and, miraculously, by mid-March, the station actually returned to the World Building, now supported with jack braces to prevent further structural damage.

**There's an unwritten code that when a guy is down and burned out, you do what you can to help him out.**

"Our damages are limited to fixing walls and doors and changing ceiling tiles and doors—minor interior damage," Sacks said. "We suffered no equipment damage."

## On the other side of town

For WNTR, the story continues.

It began for CE Dave Allen with a wake-up call from the station's GM around 6:30 a.m. Saturday.

"The fire had long since been out by then, so I decided to stay (home), trying to plan where we would go," he said. "But I finally couldn't stand the suspense."

When Allen arrived at the scene at noon, "I saw pieces of our stationery and of my manuals and reference books floating around the street in front of me. It was quite a mess."

The first priority, he said, was finding temporary studio space. "The easiest to obtain was space available with our corporate ownership, Christian Broadcasting Network, which has a television studio in Washington. They even had abandoned furniture in the space," Allen said.

The next step was finding equipment, which is where the SBE volunteers came in. Allen called McGinley. "I gave him a rundown of what I needed and he took the ball and basically did it. All I can say is that I was very well taken care of due to Tom and the SBE and those who contributed equipment. It made my job very easy."

McGinley and WPGC CE Ed Bukont began an around-the-clock search for the equipment necessary to build a station for WNTR.

In all, the engineers rounded up a cart machine, console, reel-to-reel machine, a monitor, amp speakers, wiring, a cassette deck, a limiter, a bulk eraser and "all the odds and ends it takes to originate programming," McGinley said.

The team quickly assembled two studios—and eventually a third, used for production for both WNTR and the network's needs. At 5 a.m. Monday, the station returned live programming to the air. It had broadcast a tape over the weekend through the network uplink, explaining programming was not possible due to the fire.

As of mid-March, the station is up and running, although cramped, and looking for more permanent studio and office space. Equipment losses from the fire are estimated at \$215,000.

No cause has yet been determined for the fire, but the fire department claims it started within WNTR's studio.

Still, Sacks surmised, "While nobody ever wants to experience such an event, it's heartening to know that assistance was available from so many people here in the Washington market. We literally got calls from everybody, from part-time contract guys to the big guys."

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# FROM THE TRENCHES

by Alan Peterson



## My Side of the Podium

Dear Alex,

I'm writing this shortly after completing the latest stitch in my crazy-quilt career: convention panelist.

Merely seven months back I attended my first NAB show ever; now I'm jotting notes on the train ride home from the national Intercollegiate Broadcasting System's (IBS) annual convention. Having found it difficult to stay at a single station longer than 11 months at a time, I now found myself co-hosting three panels and soloing on a fourth.

Not bad for somebody who's an expert on nothing whatsoever, save how to dunk a tuna sandwich in chocolate milk without making anyone gag.

My biggest concern wasn't *what* to talk about, but how to keep it from being dull. Too much of my own collegiate experience was one big yawner, and these students were footing some respectable bucks to attend this thing. I was determined to give 'em their money's worth.

Two weeks before the show, I contacted the ZOOM Corp. in California to borrow a DSP for the weekend (I'll tell you why later).

The Audition Tape seminar found me side by side with some heavies: WNEW's Bill Quinn and Lauri Deutsch from WKSZ. Lauri's a true *Trenches* fan and now figures quite prominently in my will. Bill and Lauri were great. Between our own personal experiences and samples of some *baaaaaad* tapes ("15 minutes before the hour of six o'clock p.m."), the workshop went by in a blur. I've got a hunch the class of '91 is gonna

be turning out some hot tapes.

The two workshops I co-hosted on production techniques were my favorites. Only because I knew The Question was coming: "What's the most important piece of production gear you use?"

My answer: "It weighs about six

**My biggest concern wasn't what to talk about, but how to keep it from being dull.**

pounds and fits between here . . . and here"—said with index fingers at each temple. All too true, Alex. The world's greatest production studio with a 24-track digital deck becomes the Cobweb Coral without imagination to run it. Get the brain going, kids.

I soloed on the Copywriting workshop

and it was like Harold Hill doing the "You Got Trouble" soliloquy from "The Music Man." Considering most college stations don't air commercials, I was fired up when the gang in my workshop grasped the concepts and began improvising commercial copy . . . good commercial copy. By the end of the session, I was exhausted from running to each corner of the room getting participants to shout out ideas—real live brainstorming. I loved it.

Tack on to this great weekend the nightlife in New York, LPB's gorgeous functional studio and the hospitality of the Penta Hotel staff. My first convention as a speaker was a genuine thrill—one I hope to repeat next year.

And even now I still feel pretty smug about my grand theatrical conclusion. My parting thoughts were on the future in the production studio, and how—when they get there—they'll find something very special waiting for them. A 16-bit digital sound processor capable of doing six effects at once. Reverb, delay, pitch transposing, compression . . .

Some kids were nodding, "Yeah, yeah, the Harmonizer, the SPX-1000, the ART Multiverb; we've got one, so what?"

Until I reached into my blazer pocket, pulled out ZOOM's Walkman-sized full-featured DSP, and added " . . . and it'll be this big. Thank you very much."

Hope I can top that next year. Talk to you next month.

—Al

Al Peterson is WLAD/98Q's production man and afternoon jock. Lauri Deutsch is in his will.

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Circle 144 On Reader Service Card

# A View of the New World Order

by Howard L. Enstrom

**MOUNT DORA, Fla.** In light of discussions planned for the 1992 World Administrative Radio Conference (WARC) regarding the global use of spectrum, it may be appropriate now to examine the changing role of translators—where they've been and what the future holds in store.

The low power translator is a spin-off of an industry that was sparked by experimenters and innovators, nurtured by government decree and exploited by financial opportunists.

Initially, FM translators weren't taken very seriously. Nearly all systems used horizontally-polarized radiation—some with cheap broadband FM receive antennas fed by flat ribbon 300 ohm "twin-lead" via a balun matching transformer.

Stories about "tremendous coverage" could be attributed to the high elevation sites used by translators. Nearly all early systems used horizontal polarization to complement FM receiver antennas, which followed television's mode of radiation. The rationale was that amplitude modulated video information is less susceptible to noise interference with horizontal antennas.

Modern translator practice has benefited from improved understanding about antenna aperture, gains and losses, E and H reference planes and wave polarization. And random noise-producing devices are under better control.

Technical improvements in FM receiver sensitivity, selectivity, AFC, channel selec-

tion and sound caused FM popularity to grow, and as it did, so did the popularity of FM translators. Listeners couldn't have cared less how a signal is transmitted. All they wanted was a full-quieting, good sound from their Sony Walkman, boombox or component entertainment center—that, plus plenty of program options to suit desires.

## LOWPOWER LOWDOWN

Social values have been cultivated over the decades by the pied pipers of entertainment, using electronic tools to tickle people with an amalgamation of fun, games and subtle ideology. The dissemination of information by modulated RF wave energy has changed the world.

Yesterday's community businesses had two-way mobile radios, telephone booths and local radio stations. Today, it's cellular telephones. Tomorrow, count on space-pathed low power mass media broadcasting, communications, telemetry, data exchange and control.

### Global RF spectrum use

International representatives are set to go to Barcelona, Spain, next year to participate in the World Administrative Radio Conference (WARC). Well-considered proposals for global use of the RF spectrum will be discussed.

The U.S. agenda will be formed from

persuasive arguments now being made before the government by diverse agencies and vested interests. The NAB, for example, is arguing from a standpoint of surging DAB technology and crowded spectrum space. Of course, the association's deep concern over the public interest and concentration of control makes the competition of space broadcasting technology very welcome, right?

Wrong. John Abel, NAB's executive VP for operations, has been quoted as saying, "The U.S. has no position on satellite sound broadcasting, largely because (broadcasters) have stated that we're opposed to it."

Continuing, he claims that some "foreign people" don't see satellite DAB in the U.S. as being a national service, just local service that may be received nationally. Uh-huh. The WARC is beginning to take on the atmosphere of a New World Order, an ideological concept on the lips of world leaders.

What would this new order be like: common world currency as well as non-terrestrial electronic space technology? Geostationary space platforms installed with coded access UHF and SHF transponders for mass media broadcasting, communications, data exchange, monitoring, surveillance, instruction and control? What would this New World Order mean for Earth?

It may have at least one benefit—for the ecology. Electromagnetic exposure would be very significantly reduced. Many FM translators demonstrate the effectiveness

of low power when terrain is not an obstacle, and how social interests and needs can be served without profit.

I believe, in this future view, translator numbers will continue to grow, until the time when full-service FMs are phased out. Perhaps some translators would be allowed to originate programming, but before long, all licenses in the 88 MHz to 108 MHz FM band would be revoked. Except for some clandestine stations, an age will have ended.

### Translator rules

The new translator rules are in place, but there is some confusion about operating power. Simply put, the distance to the 1.0 mV/m predicted contour must not exceed 13 km west of the Mississippi River, or 7 km east of the river. And in no case shall the ERP exceed .25 kW. The freeze on commercial application remains until May 1, 1991.

The FCC-amended rules are contained within a 36-page Report and Order, released Dec. 4, 1990, under MM docket 88-140. Some readers have asked me where they can get copies of these new rules (translator licensees are, of course, required to have current rules on hand).

You can obtain a copy of the report by sending a request, along with a check or money order for \$7.50, to Berry Best Services, Ltd., 1990 M Street, N.W., Suite 740, Washington, D.C. 20036.

■ ■ ■

Howard L. Enstrom is a broadcast consultant. He has owned and managed an AM station and is president of FM Technology Associates, Inc., specializing in engineering design and sale of FM translator equipment. He can be reached at 904-383-3682 or by FAX: 904-383-4077.

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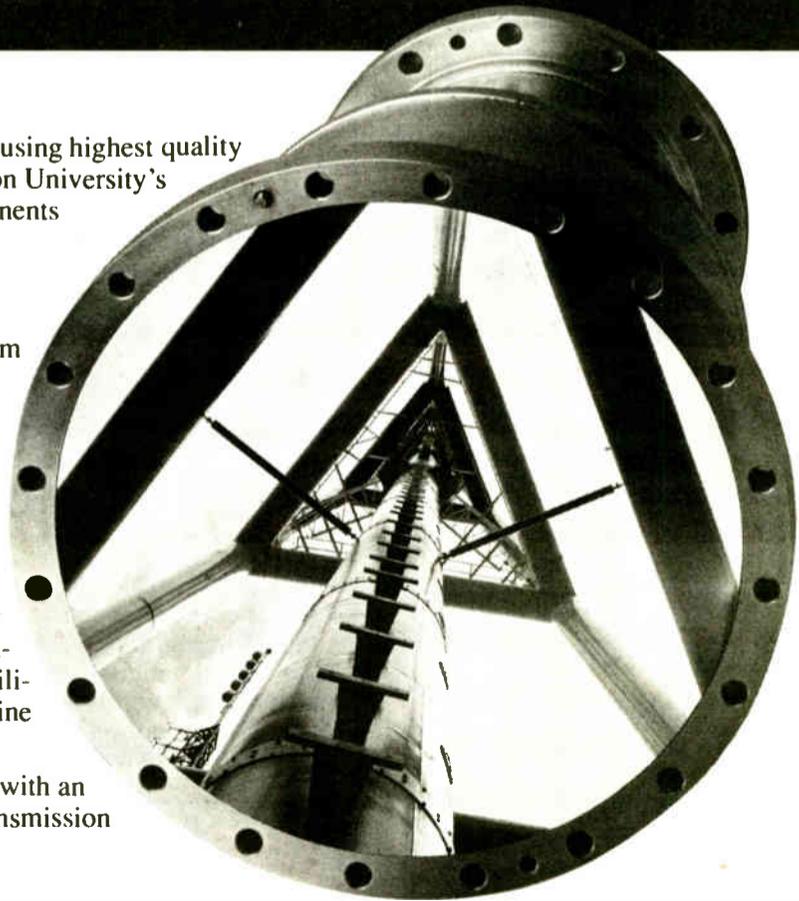
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World Radio History

# Making Business Make Money

by John Cummuta

**DOWNERS GROVE, Ill.** The last few installments of this column have dealt with starting your own consultancy or contract engineering business.

In this issue we're going to concentrate on the biggest reality of this move—money. In running a business there's only one bottom-line rule: Cash is kind.

We'll discuss how to set your prices and how to get your money. While these subjects may not seem as interesting to you as the latest processing chip or black box, they will have more bearing on your success than any technical information.

Many more people have gone out of business because they charged too little than because they charged too much. The biggest pricing mistake that most businesses, especially service businesses, make is setting their prices too low.

There's a natural tendency to put yourself in the place of the customer when it comes to setting your price. You start to think about what the market will bear, but that's the wrong question to be asking yourself.

The right question is more like, "What amount will fairly compensate me for my work and give my business a reasonable profit?"

In fact, there's even more to it than that. Look at Figure 1. This is called the

This attitude just replaces a single boss with many bosses, all of whom can fire you a lot more easily than the single boss at a job could.

To run your business like a business there are other costs that should be recovered and other returns you should see on invested money and effort.

Even something as simple as your wage should include more than you might think. When you're self-employed, the IRS expects you to pay something called Self Employment Tax, which is the equivalent of the Social Security tax that's withheld when you're someone's employee. Then you have FICA, which is unemployment insurance.

## ENGINEERING MANAGER

Plus, you won't have someone providing you with health insurance, so there's another cost you should put into to your "wage" figure.

I used \$20 an hour, but you may see that with all these extras stuffed into that amount, you're really not left with much of a wage. You may decide to increase it to \$40 or even more. Just make sure that you're paying yourself what you believe you're worth.

In the "overhead" amount, I've included such things as rent, utilities, phone, vehicle costs, test equipment leases, and a couple hundred bucks for miscellaneous expenses. These figures might be high or low for you, but they at least give you a point of comparison.

Overhead is another area where the newly self-employed person tends to discount the real costs involved. They say, "Well, I already have a car . . . and I'll work out of my basement, so I don't need to add those things in."

Be careful. Any time you "fool" yourself, you make yourself a fool. Count every cost that you'd have to pay if you were buying from someone else, because there's just the slightest chance that you might be successful and outgrow your basement. If all your pricing structures are based on conditions that don't exist in the real business world, you'll be in trouble.

Profit. Now here's a category that gets ignored big-time. Many self-employed

people think that, if they have any money left over after running the business and buying groceries, that's profit. But nothing could be further from the truth.

Profit is not something that's left over at the end of the road. Profit is something you build in at the beginning of the business. Thirty percent is a reasonable number.

Return on investment is something that is almost never considered by people starting their own business. They think that the thousands of dollars they put into equipment, supplies, overhead and other expenses is just the cost of doing business.

It may well be the cost of doing business, but it's a cost that should be repaid at a profit. What you have to consider is what kind of return could you get on that money by throwing it into CDs or other investments. Why should you get less from your own business?

If you find yourself saying, "I don't think my potential customers will pay \$50 to \$100 an hour," think again. Getting the market to pay your price is a marketing problem, not a pricing problem. We'll be dealing with marketing in more detail in the next few months, but suffice it to say there is one key step in getting your price: How you do your billing.

In most cases, your customer will not see you do all the things you'll do for your money, so if you find that there's a difference of opinion on the validity of your bill, it will be because there's a difference of awareness of the work you performed.

The way to avoid this kind of thing is to put everything on the bill. Every task you performed should be broken out. Whatever this adds to the work of preparing your bills will be more than compensated by the reduction in customer resistance to paying them.

Every time you create a bill or invoice, you are creating a sales brochure for your next job for that station. Their interest in hiring you again will be based on how much of a value they perceived they received from your services.

Another way that you can grease the money tracks is to give your customers a reason to pay you right away. Many businesses give a two percent discount for quick payment, but I suggest something more substantial.

I've frequently given five percent to 10 percent, depending on the profit margin I'd already built into my pricing structure. This gives your customers a real reason to get the money to you quickly—which can all but eliminate your later collection problems.

If you decide to charge a monthly re-

tainer, make them pay it in advance each month. This will absolutely eliminate any collection problems.

Well, I've run out of space again. Next month we'll talk about cashflow and other "accounting" kinds of information. Although this topic is not as sexy as marketing, it has a tremendous influence on exactly how long you get to stay in business. See you next month.

John Cummuta is president of Advanced Marketing Concepts, a broadcast management and marketing consulting firm. He can be reached at 708-969-4400.

Figure 1. Price Component	Per Hour	Per Week
Engineer's Wage	\$20.00	
Overhead Cost (\$30,000 ÷ 2,000 hour/year)	15.00	
Profit of 30% on Overhead and Wages	10.50	
15% Return on Investment (\$20,000) ÷ (2,000 hrs)	1.50	
Total	\$47.00	
40 hr Weekly Total		\$1,880

Nesvik system of setting service rates. It's simply a method for including all the reasonable components that should comprise your pricing. It generates an hourly rate that includes your (or an employee's) pay, plus your business' overhead costs, a profit and a good return on the investment you probably had to infuse to get the thing off the ground.

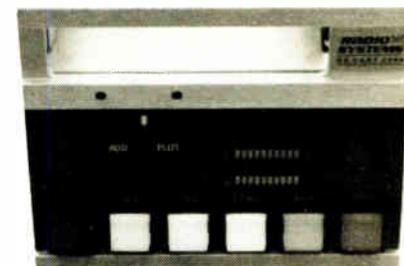
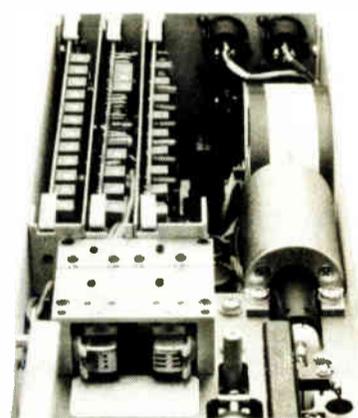
Let's look at each component separately. Engineer's wage: Let's say that you pay yourself \$20 an hour, including benefits. This is where many self-employed technicians stop. They think that paying themselves is the same as having a business, but it's not.

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# A Processing Swiss Army Knife

by Ty Ford

**BALTIMORE** A Swiss Army Knife for microphone processing—that's the Advanced Instrument Research Corp.'s (AIR Corp.) Pro-Announcer 500 in a nutshell.

If you find the metaphor strange, the following list of features might make more sense: -50 to +4dB input for everything from low level ribbon mics to line level; low (140 Hz), mid (1.2 kHz) and high (6 kHz)  $\pm 20$  dB variable EQ; effects loop with front panel in/out switch; and phase rotators for "correcting" asymmetrical modulation.

Also featured are a dynamic range

section that includes a feed forward compressor with interactive expander and sidechain equalized de-esser; 4:1 compressor with a 10 millisecond fixed attack and 40 dB/sec. program dependent release and a variable threshold; 2:3 expander with up to a 30 dB range; 1:2 gate at settings above 30 dB; a de-esser; buffered rear-panel balanced line and mic output levels; front panel headphone jack; and switchable phantom power.

If you've been looking for solutions to a variety of mic problems, the Pro-Announcer 500 should definitely be considered. I found it simple and straightfor-

ward to operate. I particularly like the accessibility of the input levels.

Although in most normal air studio situations you'd probably set the level for the mic you were using and forget about it, the ability to quickly change from -50 to +4 comes in handy when you're dealing with a wide range of mics, and a mix of -10 semi-pro and line level pro gear.

The Pro-Announcer 500 is great for consoles with no mic patch points. Just plug your mic into the 500, adjust your level, EQ compression, expansion, effects send and mix. When you've got it where you want it, run a balanced cable from the mic level output of the 500 to the mic input on your console. Of course, if you have a lousy mic preamp in the board, it will compromise whatever comes before it.

One of my first tests of the Pro-Announcer 500 was with a Sennheiser 421, an RCA 44B and a 77DX. Both RCAs had been recently rebuilt by Clarence Kane. I chose the 421 because it works so well with my voice. If I'm doing a lot of heavy screaming, I leave it in the music ("M") position; otherwise, it's set one click away from "M."

Both RCAs have a radically different sound than the 421. They are much "boomier" (they pick up a lot of low frequencies), even more than an RE20. Using the 500's EQ section, I rolled off the bottom, pulled back just a bit on the midrange and boosted the highs. The

77DX soon began to resemble the 421. The 44B was somewhere between a 421 and an RE20.

EQ sections on the unit are all peaking. The "Q" or bandwidth is less than an octave on the bass control, and two octaves on the middle and high bands.

Mic EQ is a very personal thing and I'm not recommending that you dig out your old RCA mics and put them back into

## PRODUCER'S FILE

service. On the other hand, the RCAs, when "tuned" by the Pro-Announcer 500, definitely gave my voice a thick, powerful and "meaty" sound.

Using 7 dB to 10 dB of compression, my RCA voice tracks mixed really well with music from one of my CD music libraries. Because of the increased power in the voice tracks, I was able to run the music higher in the mix. These and other similar tests seem to indicate that the Pro-Announcer 500 definitely will increase the power of your voice.

If you're an engineer who has a "thing" about symmetrical modulation, you'll like the phase rotators that are part of the Pro-Announcer's design. If you're not technically oriented, suffice it to say that many voices are not symmetrical. If you saw them on a scope, the positive and negative parts of one cycle of audio would be of different amplitudes.

Technically, since the gain from the loudest part of the cycle is normally

(continued on page 25)



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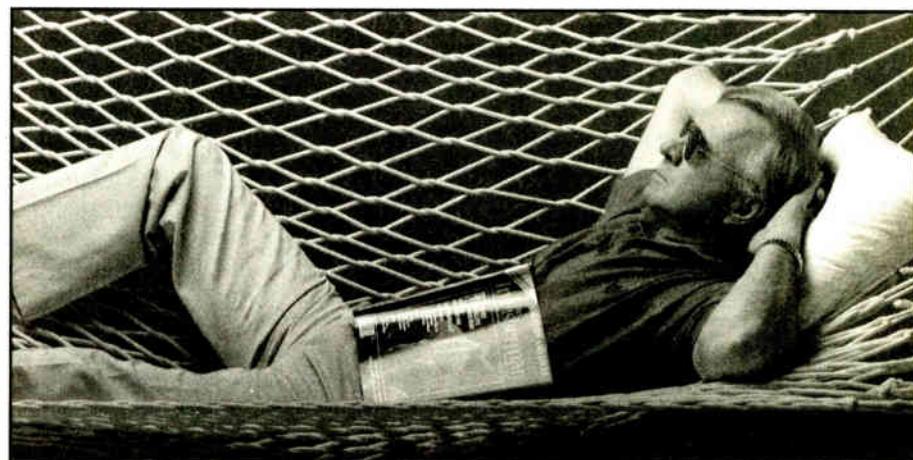
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Circle 119 On Reader Service Card

# Program Sees STL Paths in 3D

by Barry Mishkind

**TUCSON, Ariz.** Computers fill many needs in a broadcast facility. Indeed, over the past decade, the computer has moved from a luxury to a necessity at many stations.

Whether we consider program logs, bookkeeping or word processing, it's clear that few would want to return to doing these tasks by hand. Even program directors now depend on computers to schedule music faster and more accurately than ever before.

Yet, computers are still less commonly found in engineering departments. Sometimes this is a simple budgetary matter. There are only so many computers that can be had.

Other times it's because management doesn't see how an engineer could benefit from a computer. These stations often end up losing out on both the operational and budgetary benefits that having a computer-literate and computer-active engineer can provide.

Certainly, having a dedicated place in the computer system for the engineer to work allows him to be familiar with all the software in use at the station, so he can help out when other staff members have problems (and they do).

More to the point, the engineer also can get a better handle on the station inventory and parts budgets when he has easy access to a computer. With the computer, operating costs can be tracked, saving money on electricity and even improving tube utilization.

Yet, the area where a computer can save the most time and hassle for the station engineer is in computations relating to antenna sites, and distances and angles for STL, RPU and transmitter site applications.

There are many programs available to handle any need that might arise in selecting transmission facilities, as well as preparing the FCC applications

related to them.

While some stations have the manpower to do these things themselves, most stations use these programs as an adjunct to consulting engineers. The key benefit is avoiding a heavy hourly charge to do the routine preliminary calculations.

Over the past several years, the docket 80-90 FM allocations have been searched by hundreds of companies using dozens of programs designed to show what is possible.

And tasks such as locating potential transmitting sites, calculating the site's height over average terrain (HAAT) or potential coverage, and plotting STL or RPU paths are ideally handled by a computer.

## KEYBOARD CONNECTION

Some of these programs are pretty complex, providing a graph of a transmission path. Even three-dimensional representations of topographic data are achievable.

Indeed, the path plotters usually operate on only one bearing. The ability to see the entire transmission area in 3D illuminates problem areas, and for RPU shots, helps pinpoint the best options for transmission.

So, when I first saw HT3D from Radiosoft in New York, my first impression was: Why hadn't I heard of this program before?

Peter Moncure, president of Radiosoft, has been writing engineering programs for quite some time and was originally approached in 1987 by the NGDC to manipulate their 30-second database into a display program.

Several years and a lot of effort later, Moncure has developed a program that can produce not only a 3D display, but one that draws quickly and can be manipu-

lated in several interesting ways.

Moncure said, "Our design goal was a series of programs which the computer-illiterate GM could easily afford, run and understand, but which were also flexible enough to accommodate the needs of any consulting engineer."

He seems to have accomplished quite a lot. There is a nice STL plotter, an HAAT calculator, search and mapping for AM/FM/TV, and a land mobile calculator. But the jewel in this package is HT3D, a terrain analysis program that graphs the terrain in three dimensions, allowing you to "see" what standard topographic maps cannot show.

After inputting the coordinates of interest, you are presented with a display that can be rotated on-screen or zoomed in for a close view of an area. You can change the contour scale and otherwise manipulate the display so you can get a bird's eye view of the area of interest.

Looking at the display, it's easy to relate the path to local obstructions. "Zooming in" lets you see exactly where the potential problems are. If you get to the edge of the block, pushing the arrow key moves you on to the next area.

Even if you are moving across the data boundaries, the redraw rate is quite rapid and a great deal of effort has gone into correcting glitches that came from digitizing those familiar topographic maps.

Moncure noted that, due to the topographic maps' normal resolution, interpolation must be done to fill in the data. This can be a problem, with random berms appearing in a lake or false hills and holes distorting low lying areas.

Moncure has been working on several viewing enhancements that will be demonstrated at the NAB show.

HT3D is best used on a EGA/VGA color system, and since it is calculation intensive, a 286-based—or better, 386-based—computer is recommended. However, it will still run on a basic 8088 machine, even without a coprocessor.

The cost for all this power is quite modest. HT3D runs \$250, plus \$5 for each one degree square block of topographic data. You can get the entire USA for \$695. Demo diskettes are available by writing or calling Radiosoft at 1111 Fawn Road, Saugerties, N.Y. 12477. Phone is 914-246-4912.

While we're on the topic of engineering programs, this may be the last call for those of you interested in the free program offered in the Feb. 20 issue of RW.

D&A, a direction and bearing calculator that allows you to preset your most frequently used coordinates, is available simply by sending a 3.5-inch or 5.25-inch diskette and \$5 for postage and handling to: 2033 S. Augusta Place, Tucson, Ariz. 85710.

■ ■ ■

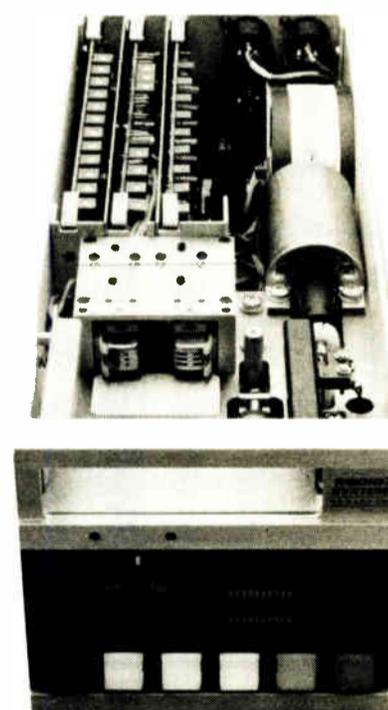
Barry Mishkind is a consultant and contract engineer in Tucson. He can be reached at 602-296-3797, or on FidoNet 1:300/11.

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Now, stations have found the TEX-20 "flawless" and "perfect in every way" (we're not

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**Paul Christensen, WIVY-FM, Jacksonville, FL**

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**Dick Byrd, WZGC-FM, Atlanta GA**

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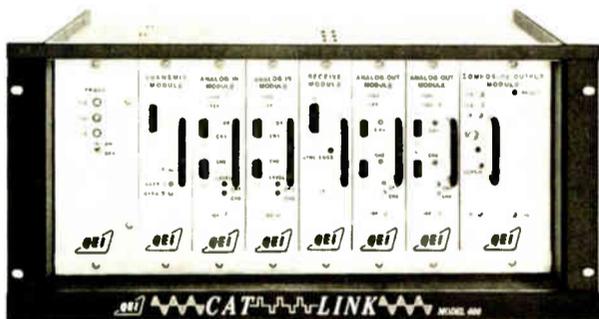
CAT-LINK is cutting phone bills for stations that don't have a clear microwave path. With CAT-LINK, a single bidirectional DS1 line replaces multiple Class A telco lines, providing multi-channel STL and TSL over the same link. Already available virtually anywhere, DS1 service is getting cheaper every day.

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Circle 52 On Reader Service Card

# Coping with the FCC's AM Station Crackdown

by Steve Crowley

**WASHINGTON** The FCC has launched a nationwide examination of AM station operating parameters. We've received a lot of calls from station engineers and managers who have received letters from the local FCC field office. The letters tell them to anticipate an inspection.

If your antenna monitor parameters or monitor points are out of tolerance, there can be several causes. Components can be damaged by lightning or excessive RF voltage. Moisture can seep into sampling line connections and cause unstable readings.

Are the phases and ratios shown on your antenna monitor out of tolerance? How can you tell whether the antenna system is really out of adjustment, or if the sampling system itself has a problem and is just giving erroneous readings?

One way to help pin this down is to check the monitor point readings. If they're OK, that's a sign of a defective sampling system; if the sampling system is accurate and the phases and ratios are way off, chances are one or more of the monitor points exceed their limits.

### Out of tolerance

If your antenna monitor parameters are out of tolerance, you may operate for a period not to exceed 120 days without further authority from the FCC, if all other operating parameters and monitor point values are within the limits specified on the station license. During that time, if repairs result in antenna monitor parameters being restored to within licensed tolerances, no further action is necessary.

Sometimes restoration is not possible. Perhaps a sampling loop or sampling transformer was replaced with one of a different type, or the sampling transformer is placed in a slightly different location, causing a different reading. Replacement of a sampling line can cause a change in antenna monitor parameters.

If parameters remain out of tolerance after all your repairs and checking, a request must be made to the FCC for special temporary authority to operate with parameters at variance. This has to be sent to Pittsburgh (don't ask) with a \$100 filing fee. I suggest stations have their communications counsel do this to make sure all the bases are covered.

The FCC's response will likely be a letter allowing such operation for 90 days. This can usually be extended upon request, especially if progress toward repair can be shown. Beware—the FCC may also ask you to reduce power in the interim to the point where the monitor points are within limits.

## CONSULTANTS CORNER

While you are operating under special temporary authority, you can troubleshoot the antenna and sampling systems to determine why the parameters have shifted. Field strength measurements should be performed to verify that the pattern is still within the standard pattern envelope. If it is, and the monitor point remains out of tolerance, you can apply to have your license modified to reflect the higher reading.

### Adjust the antenna

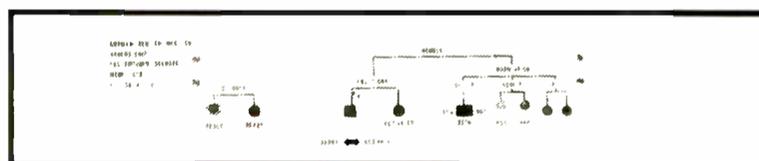
Perhaps the partial proof measurements show that the whole radial—and not just the monitor point—is out. If so, the antenna may need to be adjusted. Or maybe it's a reradiation problem caused by new structures, or old structures that have been detuned and now the detuning system is broken. Another way out may be to augment your standard pattern to increase radiation limits on that radial; with the AM freeze, though, this strategy is iffy.

Whether or not adjustments are made, a partial proof of performance must be made and filed with FCC Form 302 to support the new parameters. A modified license will then be issued showing the new parameters.

There are many ways to go about handling parameters out of tolerance. A knowledgeable and experienced technical consultant can steer you toward the most practical solution. Also, advise your communications counsel at the first sign of problems to make sure you keep things legal.

Steve Crowley is a consultant with the Washington, D.C. firm of du Treil, Lundin & Rackley, Inc. He can be reached at 202-223-6700 or by FAX at 202-466-2042.

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# The "Sikesian" Model for Radio

by Tom McGinley

**WASHINGTON** On Jan. 14, FCC Chairman Al Sikes had his turn. Newsweek magazine had just published his editorial on the future of mass communications called, "The Brink of a Revolution."

Those of us who read it carefully got a sobering glimpse of how Sikes wants to handle emerging technologies like HDTV and DAB. Chairman Sikes clearly believes that the present regulatory scheme is too restrictive and that today's communications industry power structure wants only to preserve the status quo and lock out new competition.

In short, Sikes wants to make sure that all new communications technologies are regulated in a way that maximizes their ability to deliver more choices and better service to the consuming public. What that means to existing broadcasters would surely add up to dramatically increased competition and further fractionalizing of the marketplace.

Putting the economic issues aside, it may be interesting to contemplate what a "Sikesian" model of the new DAB radio band might be like. We could call it "The Brink of a Revelation."

**Possible sources**

In order to accommodate all possible program sources of public interest value in this new superband, we will have to create four sub-bands or zones. For easy recognition, we'll use colors: the red zone will be reserved for government use, the green zone for commercial broadcasting, the yellow zone for non-commercial or public broadcasting, and the blue zone for all pay-per-listen subscription services.

In the red zone we will find such services as the NOAA weather stations, special civil defense or "EBS control" stations, a domestic service of the VOA, plus foreign government broadcast services with which the U.S. would have reciprocal broadcast agreements.

We would be able to listen to the BBC, Radio France and Radio Moscow (in English). The opportunities for the government and its bureaucracies to communicate with the public would be tremendous. There would be health services and home education services. City and county governments also would have access to their own channels.

The green or commercial zone would be home for most of the commercial AM and FM stations operating today. Metro areas would be defined by the FCC. All existing stations would be transferred into the DAB green zone over time and would continue simulcasting until the new DAB radios sufficiently penetrated each market.

Stations would be assigned power and coverage levels equivalent to what they have now on FM and AM (day-time mode) for full-time service. The FCC would protect the values of stations in this zone by limiting the number of channels for each metro area based on a total population formula.

For example, Los Angeles would get

50 channels; Washington, 30; Richmond, Va. would get 18 and Missoula, Mont. only six. As markets grew, enabling the addition of new channels, the FCC would auction them to the highest bidder. As markets lost population, causing the weakest stations to become non-viable, the owners could turn their licenses in for a tax credit.

All green zone stations would, of course, be taxed for spectrum use. However, community-needs ascertainment and performance no longer would be required for the commercial stations.

The non-commercial or yellow zone

would include all current public and non-commercial stations. These stations would pay no spectrum fees but would be required to focus their programming efforts on public issues and community needs more than they do now. As a result, formats would become less music-oriented and feature more news and talk-based programming.

Underwriting and grants by commercial organizations still would be allowed but strictly regulated. NPR would likely become even more important under this arrangement.

The blue zone would be all pay-per-

listen and subscription-based channels. They would be "leased" by the FCC to any company or individual for private in-home or car use. Once the user signed up for a given service, the particular channel being leased would be "turned on" by digital encryption in the designated radios being used by the subscriber.

Everything from unique music formats, foreign language, inspirational, motivational and special interest news or sports would be available here. Even companies owning stations in the green

(continued on page 23)

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# WORKBENCH

## The Straight Dope on PCBs

by John Bisset

**FAIRFAX, Va.** As a contract engineer, I've been surprised at the number of stations that have ignored the whole

1470. Mark Persons can be reached at 218-829-1326.

★★★

Former Deltoid, Mr. AM Stereo, and now WCXR/WCPT Assistant Engineer-

CD, eventually he'd turn around and see the indicator.

The 2N2222 was added for future expansion, either to drive additional alarm panels in other studios or to drive a solid state relay, which could control larger incandescent lights. Chris Wilk can be reached at WCXR/WCPT in Washington, D.C. His number is 703-683-3000.

★★★

Isn't it amazing how simple some ideas can be? Take my dead battery problem. I own one of those pocket-sized Fostex tone generators, and keep it in my toolbox. They're great devices as I've told

when I really need it, the battery's dead. Now, of course, I could carry around a spare battery, but I like Bud Aiello's solution better.

Bud is director of engineering for EZ Communications, and he uses a rubber grommet to keep his Fostex off. He located one that snugly fit the push button switch and presses it over the switch to keep it from depressing when the generator is being transported. When you're ready to use the generator, simply pop the grommet off and go to work.

Replacing the grommet when you're done ends the dead battery blues. I tried it, folks, and it really works. Thanks, Bud, for the tip and for proving that you can fit a square (switch) into a round

Table 1. Harris PA Module Transistor Specifications

	TIP47	NTE198
CE Breakdown	250 V	500 V
PWR Dissipation	17 W	40 W

(Gain and maximum current are the same.)

issue of PCB capacitors.

What's also been surprising is the number of transmitter companies that cannot reliably identify whether PCB-type capacitors were used in their transmitters. If you're scratching your head as well, you may want to contact Dan Churchill of Commercial Radio

**The parts can be picked up at the local Radio Shack, and you have a project that will certainly make your air staff smile.**

Supply in Vermont.

Dan maintains what I believe is the most comprehensive listing of transmitter capacitor and transformer information. To augment his lists, he has packaged complete replacement kits for various transmitters.

If you have a question about your transmitter site, give Dan a call at 802-226-7582. For more information on his services, circle Reader Service 74. You can FAX your transmitter type and list of capacitors to Dan as well; his FAX is 802-226-7738.

If you work for a station that has decided to skirt this issue, ask Dan about some of the horror stories that have occurred to stations he's been involved with. Talk about nightmares.

★★★

Mark Persons, a technical consultant out of Brainer, Minn., offered some MW-1 suggestions a few issues back. Since then, Mark had contact with Pete Walkowiak of WWWW-AM in Toledo, Ohio. Pete reports improving the reliability of his Harris MW-1 transmitter by replacing the TIP47 transistors in the PA modules with NTE198 generic replacements. According to Pete, specs are as shown in Table 1.

Pete believes the TIP47s are the weak point in the modules. His site is subject to frequent power line spikes and he has lost numerous modules because of this.

Apparently, a failure of a TIP47 causes the transistors in the module to fail. Most recently, Pete reports that after a recent power spike incident, the modules with the NTE198s did not fail, but all the modules with TIP47s did fail. He has since converted all of the transmitter modules to the NTE198. Pete Walkowiak can be reached at 419-255-

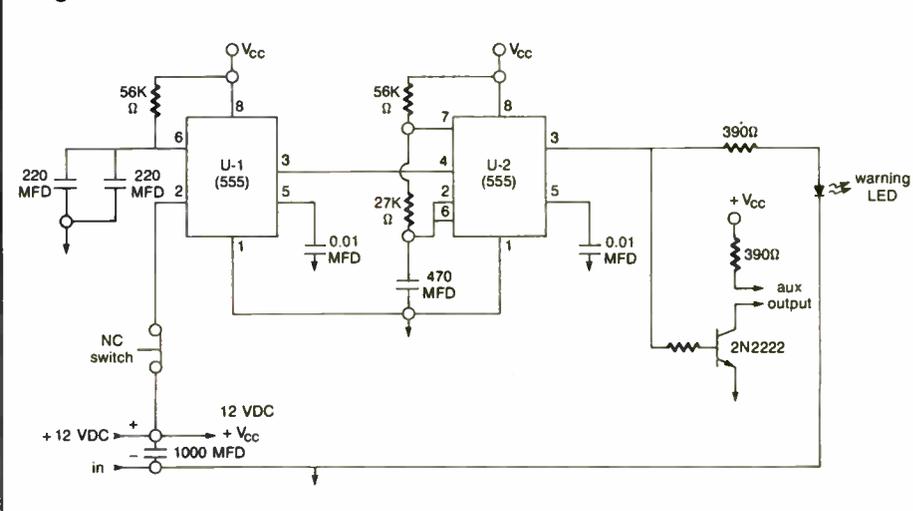
ing Manager Chris Wilk FAXed the circuit in Figure 1 to us. It's a simple "After Hours Alarm" or "doorbell" circuit that he put together after guests arriving for the station's morning show were left to cool their heels waiting for the air talent to hear their knocks through sound-proofed walls.

Add to the simplicity of the circuit the fact that the parts can be picked up at the local Radio Shack (or even your junk box), and you have a project that will certainly make your air staff smile.

Operation of the circuit is straightforward. The first timer (555) is triggered when a normally closed switch located at the door is depressed. This timer will time out after approximately 30 seconds. While the first timer has triggered, the second timer (astable) will toggle on and off once a second. The output of the second timer drives two LEDs on the over-bridge of the console which alerts the operator.

Chris designed the circuit with the monostable timer so that the warning lights would flash for 30 seconds once the button was depressed. This way, even if the talent's back was to the console as he pulled carts or was cueing a

Figure 1.



you before, but they have one little design flaw as I see it ... the on-off switch is a push button.

Rolling around inside my tool box, that little switch is always getting depressed by a soldering iron, a screwdriver or a pair of pliers. The result, of course, is

(grommet). Bud Aiello can be reached at EZ's headquarters in Fairfax, Va. His number is 703-591-1000.

■■■

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



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□ Its Noise Adaptive Threshold activates microphones for speech but not for constant room noise, such as air conditioning.

# Power 93 Moves with Ratings

by Dee McVicker

**RICHMOND, Va.** When Power 93 started showing top-notch ratings, management decided it was time to make a move. The move they made was from an isolated shopping center in Mechanicsville, where the station signed on in 1985, to a facility in Richmond, Va.

"Basically, it was an all-around move up," said the station's contract engineer Jeff Loughridge, with Richmond-based Audio Concepts and Engineering.

The move up put WCDX-FM on the third floor of a five-story building, an improvement in location and market position for the urban contemporary FM, promoted as Power 93. But the move up also introduced new concerns.

Of primary consideration was how to link the new studios with the transmission site. The old studio was within two miles of the tower and was, said Loughridge, "located right next door to a central (telephone) office. So we didn't have an STL, nor did we have phone company equalized lines."

## FACILITIES SHOWCASE

In making the move, a microwave STL was required. "The station has always had a distinctive sound," said Loughridge. "Our major concern was that an STL would degrade some of that clarity."

To preserve as much audio quality as possible, Loughridge decided to link the studio and tower sites with a discrete STL processed by Dolby SR noise reduction. The result, he commented, "is phenomenal. We're talking 90 to 100 dB signal to noise."

Another problem, however, threatened WCDX's distinct sound. "The building is about three-quarters of a mile from a 5,000 W AM and 140,000 W FM," explained

Loughridge. With interfering RF from these neighboring stations likely, sufficient grounding was needed.

What Loughridge settled on was a grounding system with eight copper rods driven through the ground and a 3/4-inch multi-pair copper cable that ran the length of the building to the station's rack room. Attaching the cable to a punch block that



WCDX's on-air studio features a PR&E console.

connected to a two-inch copper strap, Loughridge was able to ground all studios through buss wires.

Also fortunate for the station was that the third-floor suite was relatively isolated from outside noise. "We had talked about putting a raised floor in and decided against it after spending some time in the suite and listening. The studios are far enough away from any mechanical equipment that there was an inconsequential amount of noise coming through the floor," said Loughridge.

For audio that could transmigrate on the third floor, however, Loughridge was more cautious. All walls that divide studios are approximately 12 inches thick, surface to surface, and run the full length of the floor.

For furniture, Loughridge decided to move over existing Pacific Recorders furniture from the old facility to the new one. Hesitant at first to retrofit the furniture into the new studios, Loughridge was encouraged when he realized the furniture was modular. "All it took," he

said, "was removing one access panel and looking at how it was put together. It broke down into very small, easily managed pieces."

Saving the station the expense of new studio furniture, Loughridge sketched studio layouts around the existing cabinetry for the on-air, news/production and eight-track studios. Then he designed the studio wiring around the rack room, where he wired all three studios in a triangle with 25-pair cable. "There are only two or three punch blocks in the studios," he said. "Everything is wired to the rack room."

This centralized routing system, as well as on-air switchers in each studio, gives WCDX's announcers the option of calling up any studio from any studio's console or airing direct from any studio. "For the morning show," Loughridge explained, "they have the option of putting the newsroom on the air direct. So the morning guy in the control room can do what he wants, and not have to worry about having to pot anything up. Or they can bring the newsroom up on the console. It works both ways."

For equipment, Loughridge moved over

existing gear along with the studio furniture. Because the station signed on in 1985, he said, it already had almost everything that was needed.

In use are an ITC 99B for music playback and Delta three-stack cart machines for the commercial load. Otari MX5050B recorders for taping callers and Otari MTR-10 recorders for production editing are used, as well as an Eventide Ultra Harmonizer H3000B special effects unit in the station's new eight-track studio.

With the exception of the news/production studio, which has the Pacific Recorders BMX 10 console, studios were updated with new boards. In on-air, a Pacific Recorders BMX 14 was replaced with a BMX 18. "With the 14, we had used up every conceivable input, at least as far as minimizing the work on the jock," explained Loughridge.

In the eight-track production studio, WCDX upgraded to a new Soundcraft 600. Manufactured in England, the new console is, according to Loughridge, "a lot of bang for the buck," with 24 inputs and built-in equalization for each module.

In the near future, Loughridge anticipates the station will be moving up to an all compact disc music library. The idea, he said, is to air as much CD as possible. This will be "another refinement in the overall sound," and will further WCDX-FM's new image and position in the Richmond market.

Dee McVicker is a free-lance writer and regular contributor to RW. To inquire about her writing service, call 602-899-8916.

## Ways to Extend Your Construction Permit

by Harry Cole

**WASHINGTON** One of the natural consequences of the Commission's addition throughout the 1980s of new FM channels is a plethora of outstanding construction permits.

All the channels created through docket 80-90 have now been made available to applicants, and the vast majority of them have been doled out to (presumably) eager permittees. Our text for today? "No Time Left for You" by The Guess Who. That's right, we're talking about extensions of construction permits.

As you probably know, an initial AM or FM construction permit is good for 18 months. In a perfect world that would be plenty of time to acquire equipment, build a studio, hire staff, buy business cards, lease a fancy car and get on the air.

## COLE'S LAW

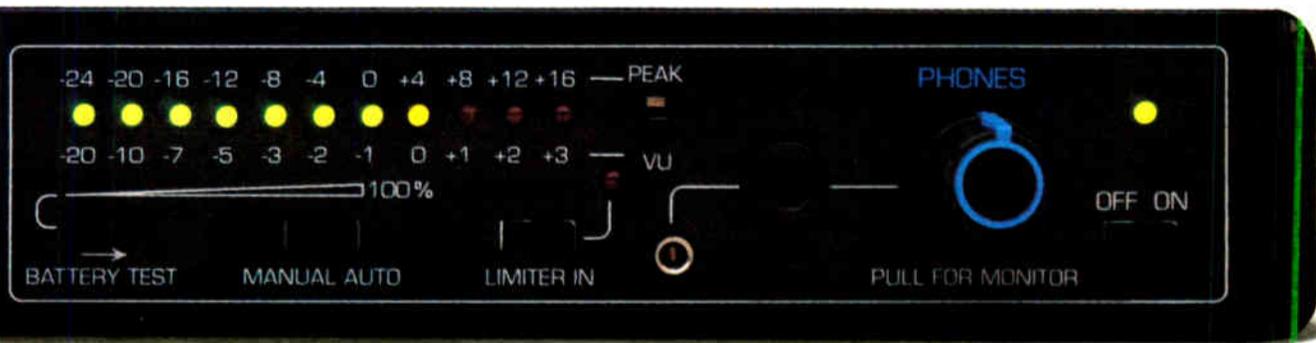
But life in these highly competitive times tends to be less than perfect. As a result, it is not at all unusual for a permittee to find itself near the end of its 18-month rope without any hope of completing construction in time. The question then is: what to do?

The good news is that permits can, of course, be extended. The bad news is that the Commission has, over the past several years, become increasingly tightfisted about granting extensions. Here are a few tips on how best to position yourself so that you (and your communications counsel) might increase your chances of getting an extension.

### Sooner not later

First, you should understand that the Commission really believes that when it

(continued on page 24)



FP410 Mixer shown actual size.

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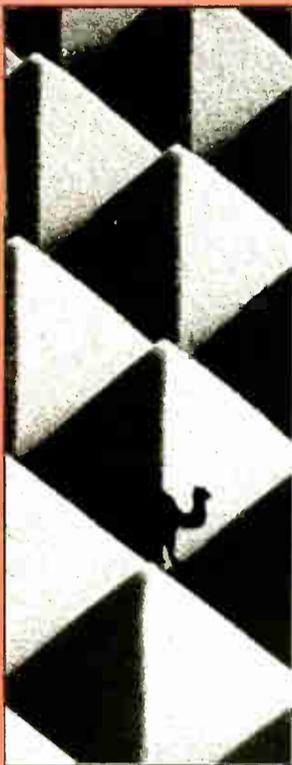
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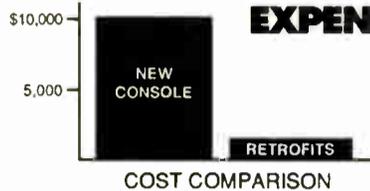
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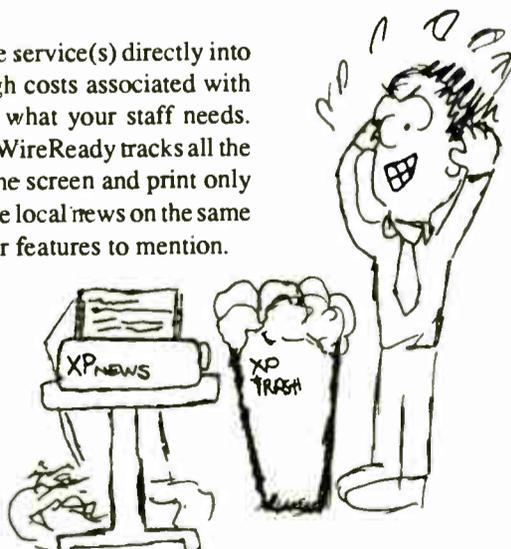
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# The "Sikesian" Model for Radio

(continued from page 19)

zone would be allowed to lease channels in the blue zone.

For example, WINS in New York may decide that a significant market exists in Tampa, Fla., for New York local news. WINS would lease a blue channel in the Tampa metro area and charge subscribers \$4.95 a month. Penn State University could lease a Washington metro channel in the blue zone to carry Penn State football games to Nittany Lions fans for \$3.95 per game.

alone AM stations when FM started taking over. The FCC made no effort whatsoever to help stations like KJR in Seattle or KLIF in Dallas. Read Sikes' editorial again and you won't see a word about the need to protect today's broadcasting industry.

While the scheme presented here incorporates many idealized notions of how a new comprehensive DAB radio service could be structured, it nevertheless represents a logical extension of what any good public official would

If our four-colored DAB band ever became reality, obviously there would be tremendous changes and opportunities for today's broadcasters.

### Dramatic increase

Because of the dramatic increase in channels, as happened with cable television, there will be an enormous demand for programming and management.

As new channels are created, increased minority ownership opportunities will be encouraged and supported by the FCC. The tax certificate could be even more advantageous in the future.

The size and importance of the FCC would grow dramatically as spectrum and lease fees began rolling in. This would be the additional revenue that Congress has been hoping to garner from the broadcasting industry to help balance the federal budget.

Most commercial broadcasting companies also would lease a number of subscription channels in the blue zone, thereby increasing their total revenue base.

Major radio group operations could become radio networks, specializing in programming and management systems. Like other existing networks, such companies still would have owned and operated stations in the green zone, but in addition would be very active in the blue zone.

Live broadcast of college sports events may only be available in the blue zone, as universities go into sports programming on their own and keep the subscription money for their athletic programs. The NCAA would most likely be heavily involved.

Today's FM subcarrier services would transfer into their own subscription channels in the blue zone. Many of these services would utilize satellite for nationwide coverage.

For the first time, broadcasting companies would be dealing directly with the consumer. Many existing products avail-

able over the 900 telephone service could be purchased cheaper over the DAB blue zone. This could be a great supplement to traditional advertising revenues.

There also would be new opportunities for broadcasting companies to compete with newspapers, especially in the area of classified advertising.

Whatever form a new DAB band may take, it is likely to include direct satellite channels, as well as new channels and programming services, plus minority ownership preferences. Today's broadcasters who are prepared to adapt to these changes and take advantage of the new opportunities will not only survive, but prosper and grow stronger in the future.

■ ■ ■

Tom McGinley is director of engineering for Cook Inlet Partners and RW's technical advisor.

**In short, Sikes wants to make sure that all new communications technologies are regulated in a way that maximizes their ability to deliver more choices and better service to the consuming public.**

Companies like Digital Music Express, which want to deliver perfect CD-quality music services, would lease channels in the blue zone. Such leases would be obtained directly from the FCC or subleased from another company.

This four-color framework for the new DAB band would include a section for each sub-band for direct satellite delivery. This would allow specific stations or services operating within each sub-band to broadcast to a nationwide audience. Such services would lease these satellite channels from private carriers, like IDB, and would pay an "extended coverage fee" to the FCC.

### Protecting today's broadcasters?

Various strategies are being discussed by broadcasters on how to stop entrepreneurial satellite programming on DAB. The NAB is leading this battle with its proposal to license Eureka 147 for all current AM and FM stations on a new DAB band.

The industry may be under the false assumption that the FCC will fully protect commercial broadcasting. Recent history reveals gigantic losses for many stand-

probably like to see happen. Put yourself in the position of Al Sikes or any of the FCC commissioners.

The advent of DAB has created a panoply of opportunities for broadcasting to better serve the public. If you were Sikes, you too would want any such restructuring effort to fully exploit the advantages of DAB technology so as to deliver the widest array of choices to the consumer at the least cost.

This country has led the world in perfecting the mechanism that provides for the successful development, manufacture, marketing and distribution of all goods and services. Our free market economy has always had a dynamic of its own, as competition constantly creates more and better products and services.

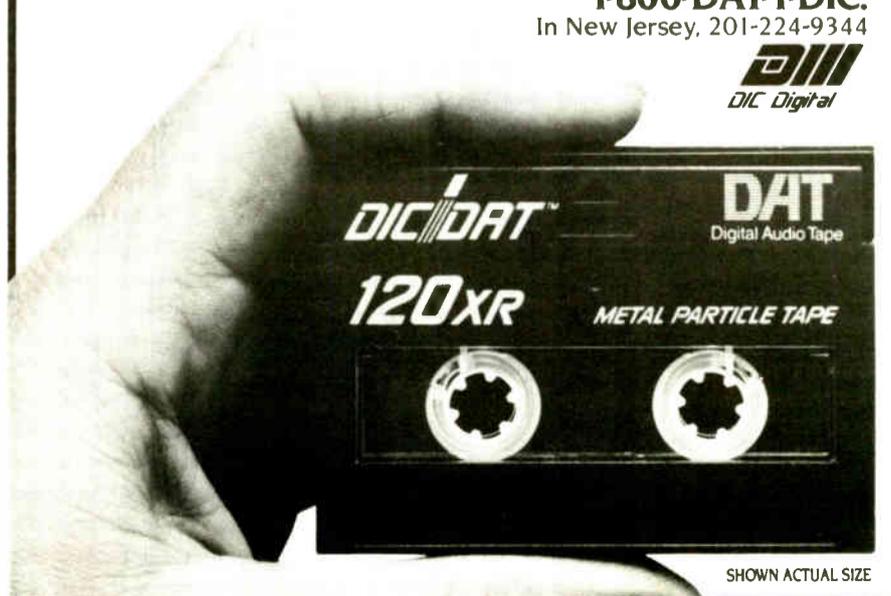
Those who have stood in the way of these forces, attempting to preserve status quo monopolies, are either swept aside or forced to adapt to become part of the ever-evolving mainstream. Why should broadcasting be any different? Existing commercial broadcasting companies simply will have to adapt to the new forces changing the marketplace.

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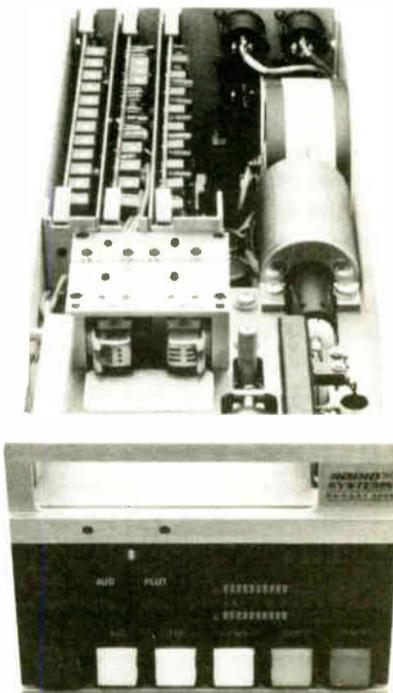
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# Ways to Extend Your AM or FM CP

(continued from page 21)

issues a construction permit, the permittee does, in fact, intend to build the station sooner rather than later. Because of that belief, the FCC expects its permittees to take appropriate steps toward construction, and it is disappointed when it finds that the permittee has just sat on its hands for 17 months.

So, the first thing to do is to do something—anything—that is intended to further your construction efforts. That could include ordering equipment, entering into leases (for your studio or transmitter site), filing the necessary materials to secure zoning or land use approvals, etc.

When you ask for an extension, the FCC

is going to want to know what you've done to help yourself. It is very useful to be able to submit some concrete, documentary evidence showing that you have in fact made good faith efforts to move the project along. And it is especially useful if you can demonstrate that these efforts were made in the early rounds, not just in the last week or two before the permit was set to expire.

The second thing to do is to keep in reasonably close contact with your consulting engineer and your communications counsel with respect to your progress (or lack thereof). If you're really trying to get on the air, they may be able to help you get around any

roadblocks that crop up. And if timely construction is not necessarily what you have in mind, they may be able to advise you on how best to proceed to avoid any disappointments.

## Take certain steps

That doesn't mean that any of your professional consultants can, should or will assist you in committing fraud—in fact, their best advice may at times be simply to build the station without hesitation.

But they may also be able to advise you to take certain steps that may demonstrate to the FCC your determination to complete construction, even though those steps may not in and of themselves result in final (or even near-final) construction.

You should also understand that the FCC does not require that you perform miracles, and it is aware of at least some of the basic truths of the physical universe. Thus, the Commission generally accepts that, in the dead of winter in northern Minnesota, it may be difficult to install a new transmission system because of weather conditions.

The FCC also accepts that your progress might be blocked by other administrative agencies (like the local zoning board). The important point is to be able to show the Commission that these or other immutable factors have prevented you from moving forward.

Perhaps most importantly, you should be sure *not* to try to shade the truth when you ask the Commission for an extension. While it may be tempting to claim that all equipment has been delivered or that the tower has been erected and most of the

transmission line strung, don't say it if it isn't true.

All too often a competitor, an adjacent site owner (perhaps unhappy at the prospect of a 500-foot tower with strobes and lots of RF generators being built next door), or just some troublemaker may blow the whistle on your game. The FCC takes misrepresentations seriously regardless of the fact that they may be made "only" in an extension application. The result could be that you would not only lose your permit, but you might find yourself disqualified from ever owning a station.

Finally, if you want to sell your permit, don't count on that carrying any weight at the Commission. As far as the FCC is concerned, you asked for the permit, and that means that *you* wanted to build the station.

## Wants to know

Again, the Commission is going to want to know what you have done to construct. So be prepared to make all the showings discussed above. In addition, you should be sure that the party trying to buy the permit is prepared to commit to pursuing construction promptly, because the Commission is likely to require some such commitment.

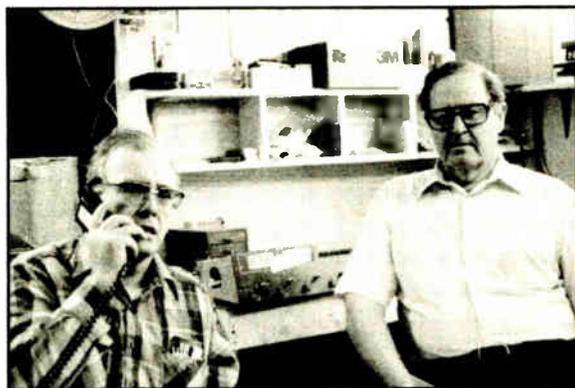
Construction permit extensions are not impossible nor even particularly difficult to get, given the right circumstances. They just require some forethought and some understanding of the FCC's expectations—and a willingness to take the right steps from the beginning to assure that you won't be disappointed down the line.

■ ■ ■

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

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# Pro-Announcer: Swiss Army Knife for Mics

(continued from page 16)

adjusted to the maximum level before distortion, the quieter half is lower in level. That means the average level is less than if both positive and negative peaks are of equal amplitude and are adjusted to the maximum before distortion.

By rotating the phase of the signal at the right time so that the positive peaks become negative and the negative peaks become positive, the asymmetry is lessened. Unfortunately, this phase shift also "smears" the higher frequencies, which takes the edge off the crispness.

Phase rotation is fairly common. Different manufacturers use different amounts of phase rotation to achieve what they believe to be "the right amount." Unfortunately, the amount differs for each person.

Since the circuits can't really tell exactly when or how much phase rotation to apply to specifically correct a problem, phase rotation ends up being a cover-up effect rather than a cure.

I found the audible phase shift caused by the phase rotators to be very distracting during recording. The effect is more noticeable when you're using headphones while recording because the phase shift you hear in the headphones is interacting directly with your real-time hearing. Fortunately, the designers included an internal jumper to eliminate the phase rotator circuit.

I discovered a few tricks that gave me maximum impact from the compressor and maximum quieting from the expander. If you're using the expander to reduce noise in the studio, make sure you set enough compression to balance the expansion. If you don't, the expander will expand the dynamics of your voice, resulting in a weak and wavering voice track. I found any amount of compression over 7 dB worked fine.

You can get the maximum setting from the expander by adjusting the display to about 30 dB, cranking up the headset and listening for the very small glitch that occurs when the circuit shifts from expander to gate. Adjust the control to the expander side of the glitch.

I found the 500 passed both the "electric-fan-on-in-the-room" test and the dreaded "open-the-door-to-the-furnace-room-while-the-furnace-is-on" test nicely.

I use these tests to simulate worse than average noisy studio conditions. I can't say that all of the noise was removed, but it was reduced to a very insignificant level. In addition, there were no overt gain reduction side effects other than the expected loss of high frequencies when gain reduction exceeded 10 dB.

According to Mike Morgan, president and chief technical officer of AIR Corp., the Pro-Announcer 500 is an engineer's box as well as a production person's box. He appreciates features such as dip switches to make sure the line level, de-ess and send on/off and volume input/output indicators reset properly if someone accidentally kicks the plug out; separate buffered outputs for line, mic and headphone outputs; adjustable rotation points for zeroing compressor and expander and display calibration adjustments.

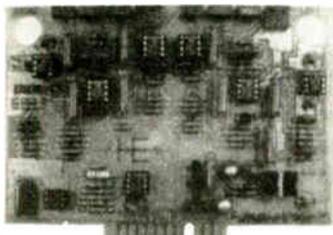
There's even a DB25 pinout on the back panel that allows you to rack-mount the chassis and operate all of its controls remotely. List price for the Pro-Announcer 500 is \$699. For information, call Mike Morgan at 615-254-4900 or Jim Loupas at 214-255-0550; or write 500 Napoleon Ave., Nashville, Tenn. 37211. FAX is 615-242-7107.

♦ ♦ ♦

*Ty Ford is an audio producer/voice talent. Reach him by phone at 301-889-6201, via MCI mail #347-6635, or via America Online (Tford).*

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# BUYERS GUIDE

AM Transmitters and Exciters

## Nautel a Winner for Dallas

by W.C. Alexander, Dir. Engineering  
Crawford Broadcasting Co.

**DALLAS** For a new station we were granted here in Dallas, Crawford Broadcasting began searching for a new transmitter. We looked at all manufacturers' products—tube-type and solid-state.

Cost certainly was considered, but initial cost was not as big a factor as long-term operating expense. Circuit design, mechanical construction, serviceability and product support were all big factors.

### USER REPORT

We finally decided on the AMPFET ND-10 from Nautel Electronic Laboratories. The transmitter arrived by air freight in five crates. One of the crates was the main transmitter chassis; two contained the 1.25 kW subsystems (cubes, in Nautel jargon); one contained the power supply and the remaining crate held spares, manuals and ancillary parts.

#### A cut above

My first hint that this transmitter was a cut above the rest was the presence of the ancillary parts kit. This contained an assortment of installation hardware such as lugs for terminating the AC power feed to the transmitter, crimp lugs, tie wraps, assorted toroids, spare

fuses and hardware—you name it. Everything we needed to hook the transmitter up was there and more.

The manual contained concise, step-by-step assembly instructions. Nothing was left to chance. We had more trouble getting the crates open than we did assembling the transmitter.

In reality, there was not much assembling to do. We had to install the power supply in the main chassis, plug in the eight cubes and connect the AC, antenna, external (stereo) drive and remote control cables. About all that was left was the shorting clips on the meters. The transmitter was delivered around 4 p.m., and we had it operating by 10 that same evening.

Adjusting the taps on the power transformer took a couple of attempts before we got it right. Then, we were ready for the pre-turn-on checkout. That took all of five minutes. Following a checkout of each power cube, we were ready for some power.

Turning on the AMPFET ND-10 at full power was disappointingly anticlimactic. It came on and worked—quietly, efficiently and with no smoke, pops or loud bangs, and it worked the first time.

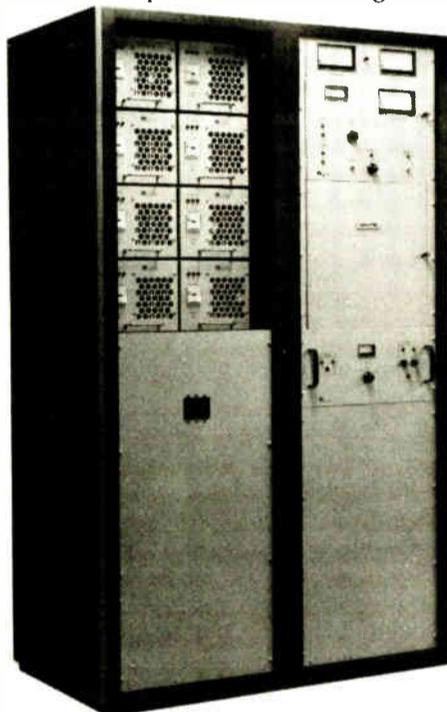
As I gained experience with this transmitter, I liked it better and better. Its features are all that I could ask for.

#### Full-featured unit

First, the five-level power selection should satisfy even the most demanding PSA/PSSA/DA power requirements. I'm not sure how low this transmitter is in-

tended to go, but I had no problems running it at 100 W during DA setup. All five power levels are remote control selectable.

The front panel meters are large and



Long-term operating economy led Crawford Broadcasting to the Nautel AMPFET ND-10.

easy to read. Each power cube has its own individual ammeter, making troubleshooting easy. A dual-scale direct-reading power meter is included on the front panel, as is a reflected power meter—a real plus for matching. A test meter is mounted on the exciter for low voltage monitoring.

SWR protection is excellent. The protection circuit features an event counter with an LED display. When a certain number of SWR events occur within an adjustable period of time (seven minutes to 60 minutes), the power is reduced by a certain amount.

If the count continues to increment, the power is further reduced; eventually, if the count continues to increment, the power output is completely muted. If no more SWR events occur in the next time period, the count is decremented and the power comes back up a notch. This will continue until full power output is restored.

This SWR protection system is smooth and fast. In tuning up the DA, I suppose we inadvertently did everything you can imagine to the transmitter's load—opened it, shorted it, arced it across. The protection circuit prevented any damage from being done to the transmitter. It even made it through one of the worst thunderstorm seasons on record in North Texas without a glitch.

#### Remote controllable

Status indications are provided on the front panel for PA Fail, Drive Fail, Interlock and SWR Alarm. All these alarms are provided for the remote control via open-collector status outputs. There are no interlocks within the transmitter itself; you can open any door with the unit operating. The interlock is an external closure

(continued on page 38)

### Correction

The telephone number for Kingdom Technology was incorrectly listed on page 37 in RW's Feb. 20 *Buyers Guide*. The correct number is 904-664-6492.

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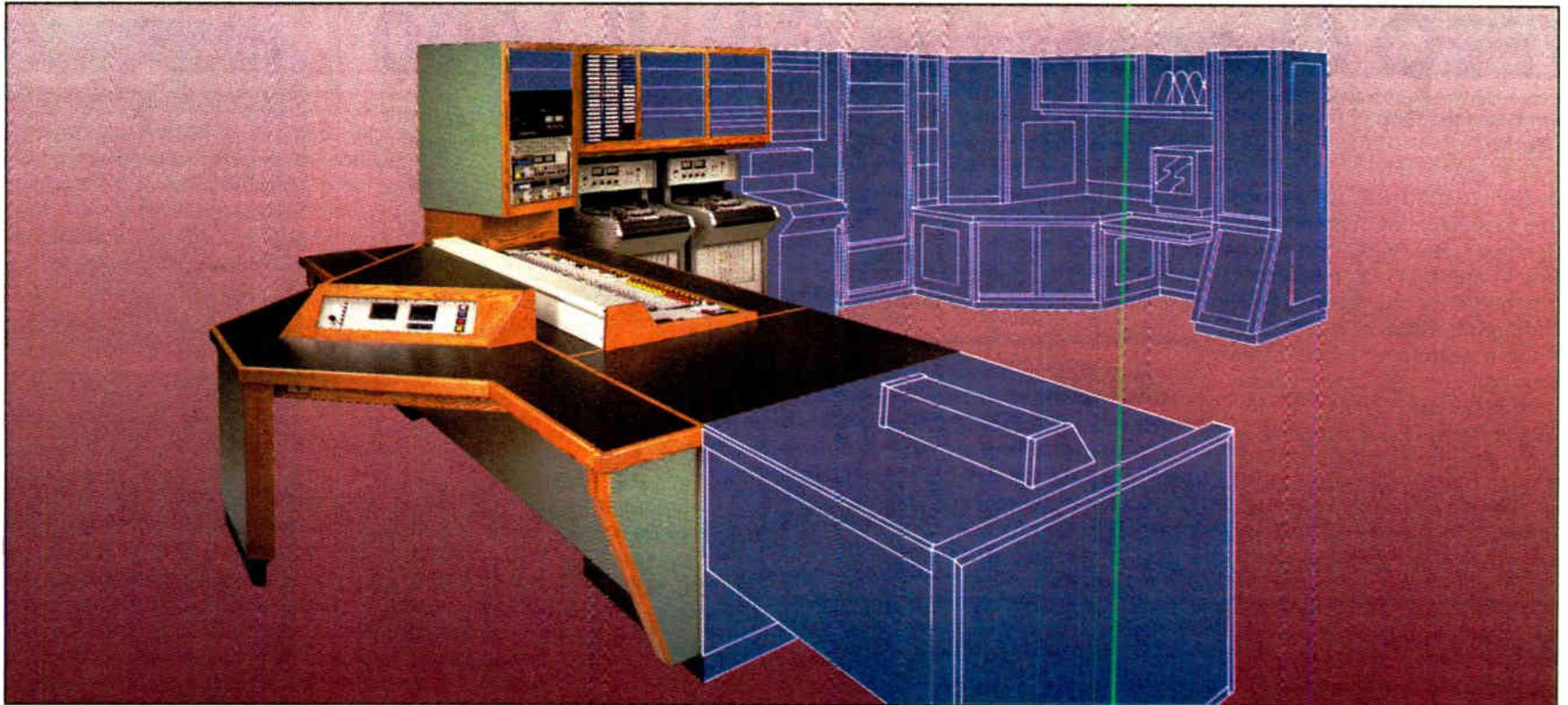
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## BUYERS GUIDE INDEX

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Plus: A special report from Armstrong Transmitter Corp.; and a technology update from Energy-Onix.



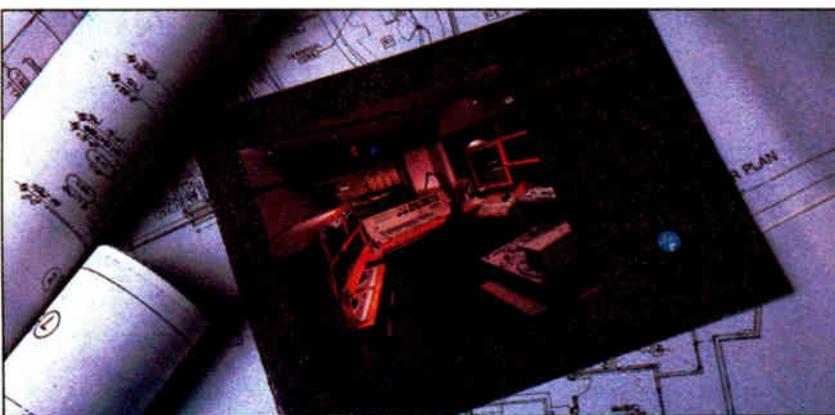
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Circle 48 On Reader Service Card

# WPEO Chooses the OMNI-1000

by Robert Ulrich, GM  
WPEO Radio

**PEORIA, Ill.** Last August, we decided it was time to replace our only transmitter, a tube-type Gates BC1G. Two questions came to mind: Which transmitter do we buy and how much will it cost?

In gathering information and pricing various AM transmitters, I noticed an advertisement for the Omnitronix OMNI-1000 solid state transmitter.

I had never heard of the company, so I called for information and pricing. Upon receiving the literature about the four-year-old manufacturer and after several telephone conversations with the president, David Solt, and his brother

deep, 58 inches high and 325 pounds—to Peoria in a single engine Piper Malibu. I hadn't heard of that being done before.

We loaded the four modular components—the control unit, the power amplifier unit, the antenna interface unit and the power supply unit—into a small pick-up truck and drove to the station.

## USER REPORT

In about six hours, our OMNI-1000 was fully assembled, adjusted, tested and ready to go.

The OMNI-1000 has numerous in-

teresting features. Among them, I was impressed that Omnitronix uses world-common parts throughout the design and provides all component manufacturers' numbers. All modules are fully interchangeable without tuning and built with off-the-shelf devices, the company says.

modulator will not shut the transmitter down, because of the OMNI-1000's pulse duration modulation technique which, coupled with the transmitter's MOSFETs, allow the OMNI-1000 to operate at high efficiency.

### Quick and easy

Modularity in the design allows for quick and easy servicing: All components are in four 19-inch-wide assemblies.

Input power feeder protection provided by circuit breakers, high-power MOVs, an isolation transformer and voltage impulse filtering providing lightning protection are other impressive features. All DC circuits are protected by fuses, on-board voltage regulators and surge suppressors. The antenna line is protected by a hermetically sealed spark gap, ferrite toroids and a high VSWR detect circuit.

VSWR protection is provided by a dual directional coupler and detection circuitry. The OMNI-1000's specified VSWR at full modulation is 1:2:1. The transmitter will continue to operate with a loss in efficiency and performance up to a 2:1 load mismatch.

Diagnostic LEDs provide quick and easy identification and location of problems. Forward and reverse power are monitored and all power amplifier modules have on-board over-temperature sensors that remove a module from service as long as the condition exists.

### Costs reduced

Because of the high efficiency of the OMNI-1000, our power consumption and energy costs have been reduced. Plus, the benefit of no vacuum tube replacements gives us better audio quality and greater reliability than tube-type transmitters.

Finally, Omnitronix offers a module exchange program with rapid turnaround of damaged modules. In the event



WPEO's OMNI-1000 arrived at the station by way of a single-engine Piper Malibu.

that damaged components cannot be replaced at a local semiconductor distributor, they can be obtained from the company, or Omnitronix will repair them for you.

I feel that the OMNI-1000 transmitter already has proven to be a wise investment. I heartily recommend it and Omnitronix. I believe the company has a fine product, an understanding of what transmitter design involves and a personal concern that their customers receive quality service.

For information on the Omnitronix OMNI-1000, contact David Solt or John Solt at 215-542-9580; FAX: 215-542-9582; or circle Reader Service 151.

**In about six hours, our OMNI-1000 was fully assembled, adjusted, tested and ready to go.**

John, I decided that the OMNI-1000 was just what we were looking for in a solid state AM transmitter.

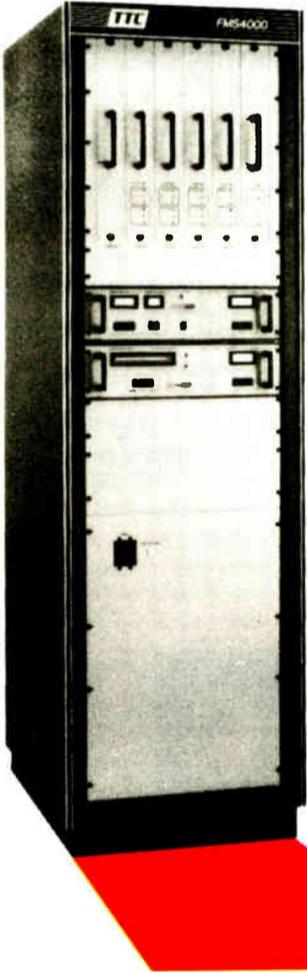
### Delivery by air

Our OMNI-1000 solid state transmitter was delivered in October. But this particular transmitter delivery was different.

Omnitronix flew the 1000 W AM transmitter—22 inches wide by 30 inches

teresting features. Among them, I was impressed that Omnitronix uses world-common parts throughout the design and provides all component manufacturers' numbers. All modules are fully interchangeable without tuning and built with off-the-shelf devices, the company says.

Redundancy allows for consistent operation and minimal downtime. MOSFET failures in a power amplifier or

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# AM: And the Band Plays On

Armstrong Transmitter Corp. serves a specialized market with its sales of reconditioned transmitters and antennas. Clients include small market engineers looking for an inexpensive used transmitter, as well as burgeoning facilities overseas searching out a good deal on a late model unit. Because of the broad base Armstrong serves, RW asked the company to provide an overall perspective on the state of AM in today's worldwide marketplace.

by **Conrad Trautmann**  
Consulting Engineer, and  
**Elisa Morales-Fasulo**  
Exec. Dir. of Intl. Affairs  
Armstrong Transmitter Corp.

**SYRACUSE, N.Y.** Trying to compete with music on AM in the shadow of the cleaner, clearer sound of FM has presented a tremendous challenge in recent years for AM radio.

On the domestic front, many small market AM broadcasters struggle to keep their stations on the air, while large markets seem to be narrowing down to one or two strong stations per market. The larger stations maintain their strong positions with programming that often cannot be heard on FM in the market—usually news and talk formats.

## SPECIAL REPORT

Historically, AM was doing just fine until the mainstream acceptance of FM, when the general public caught on to the advantages of the new band's clarity and stereo sound. AM, meanwhile, was being subjected to more pronounced interference troubles as new stations inundated the band.

Once the AMs started noticing listeners moving to FM, it became necessary to make some changes. Technology of AM transmitters and antennas improved, and the size of the transmitters decreased.

Solid state was introduced, which reduced operating costs, compared to the monsters that used to take up an entire room and use double and triple the electricity to produce the same power.

Transmitters became more reliable, with fewer components to fail. Equipment also became more stable (in terms of frequency and power control) and could be operated remotely. Engineers no longer had to babysit the gear 24 hours a day.

AM stereo also offered hope for AM's recovery. Unfortunately, the FCC's hands-off approach toward selecting a transmission system worked against some AM stations. Receiver manufacturers delayed the introduction of receivers while waiting for an endorsement from the FCC on a de facto standard. Many stations went ahead and purchased what they thought was the "correct" equipment, only to find they had made the wrong decision.

Some more recent attempts to help the AM band include the FCC's implementation of the National Radio Systems Committee (NRSC) audio and RF standards, which have helped reduce the amount of interference between stations. This rule change is important to broadcasters, because it sends receiver manufacturers a clear signal of the importance of opening up the bandwidth

on radios and improving the quality of the received signal.

In our opinion—even with AM's problems of the past—if you listen to a well-maintained station today with the NRSC and AM stereo equipment installed on a receiver that can decode both, you'll find the sound to be competitive with FM. The only exception is the loss in high frequencies due to the NRSC audio filter.

Many combo owners now also simulcast their FM's on the AM. This has some good and bad points. From the AM side, it means one less independently formatted AM. From the owners' standpoint,

it increases ratings, and thus revenue that the station might attract by adding the AM and FM numbers.

At Armstrong, we see a surplus of used AM transmitters available domestically. On the international front, however, we see more of a demand for used AM transmitters. Many third-world nations, whose broadcasting is run by the government, have been lifting regulations and allowing more independent AM and FM stations.

These countries are considerably behind the U.S. in the development of the broadcast band. They don't have the capital available to purchase new equipment

and are happy with older transmitters and antennas that are no longer adequate for stations in the competitive U.S. market.

In countries like South Africa, the broadcast bands are very underdeveloped. The receivers available to these countries also are limited and many cars have only AM radios. Broadcasters that have been operating with home-made transmission equipment are calling the U.S. to upgrade to more powerful transmitters.

AM may not be as strong as it used to be in the U.S., but it is far from dead worldwide.

■ ■ ■

For information on Armstrong Transmitter Corp., contact its founder, Sinan Mimaroglu, or Bill Hoffman, VP of sales and service, at 315-488-1269; FAX: 315-488-1365; or circle Reader Service 98.

Probably not. But the new Shure VP64 microphone could go on with show, after show, after show.

The new Shure VP64 is good news for broadcasters—and their audiences.

In short, it delivers all the qualities you demand for a broadcast microphone—and then some. A high-energy neodymium magnet in the VP64 maximizes signal-to-noise

ratio. Result: your on-the-scene reports cut through background clutter to make sure your audience gets the message. What's more, the frequency response is tailored for unbeatable speech clarity and crispness, while all but eliminating boominess and low frequency background noise.

And you won't find a better looking,

easier-handling microphone anywhere. All of which makes the competitively priced VP64 the best value in its class.

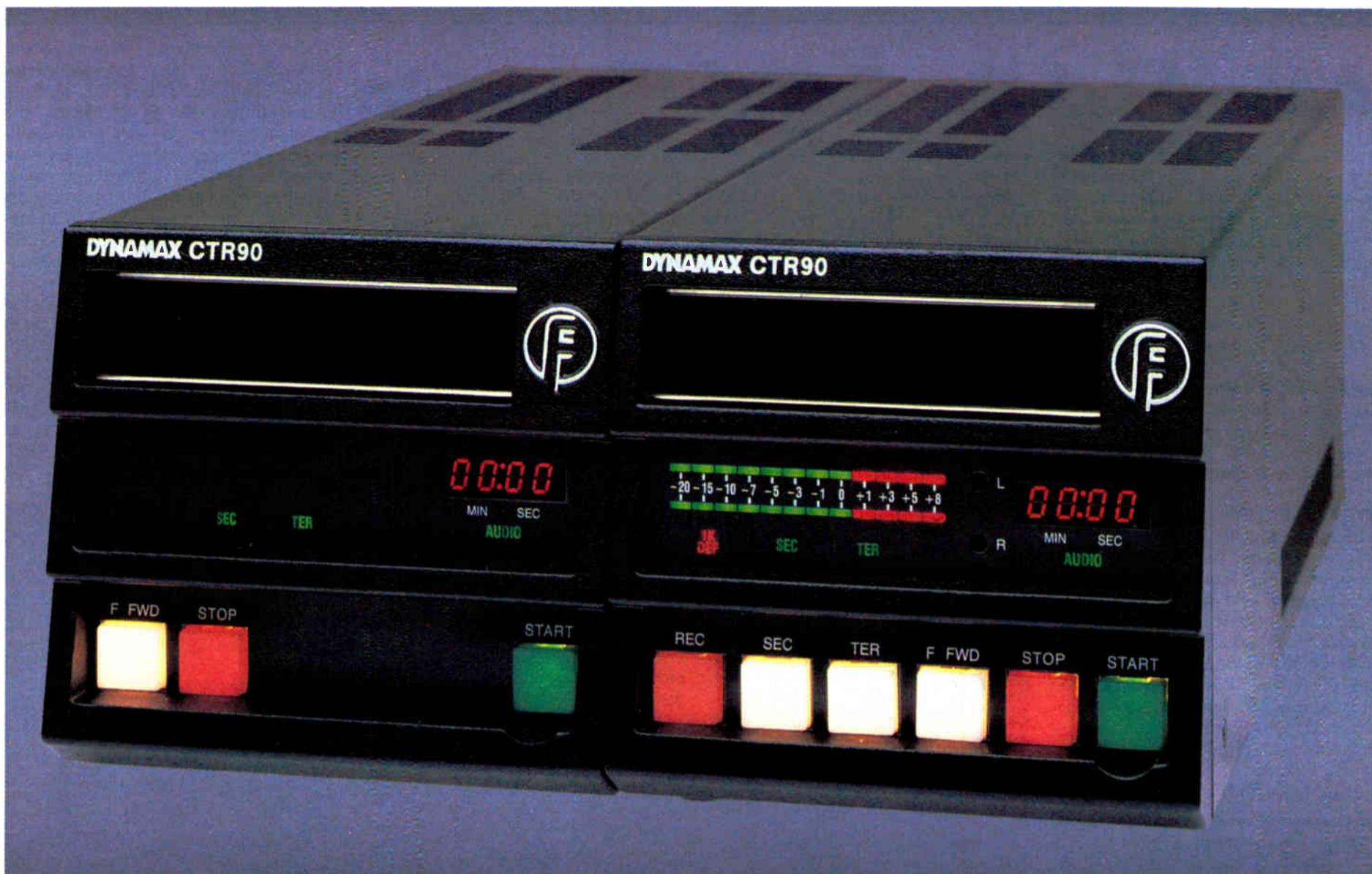
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*Dolby HX Pro Headroom Extension originated by Bang & Olufsen and manufactured under license from Dolby Laboratories Licensing Corporation.*

*DNR is a registered trademark of National Semiconductor Corporation under U.S. Patents 3,678,416 and 3,753,159.*

Circle 96 On Reader Service Card

World Radio History

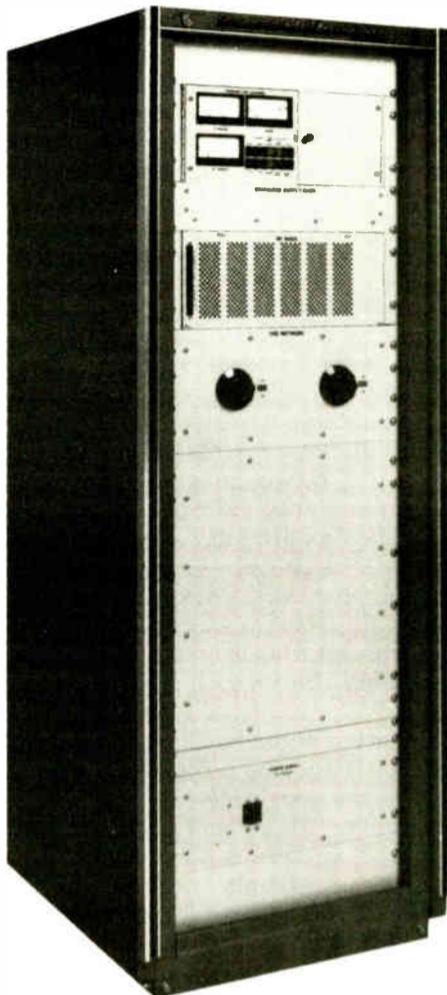
# New Sound for a New Format

## Continental 314F-1 Offers KHVN Brighter Highs And the Advantages of a Solid State Design

by Ken Fine, Technical Director  
KHVN Radio

**FORT WORTH, Texas** In 1985, when the FCC computer spit out all those new low power levels that daytimers could use at night, KHVN found itself with a power level of 280 W. The Commission also lowered the licensing level from 500 W to 250 W—all of a sudden

I have been in the industry for 20 years and worked at several AM stations throughout my career. The older transmit-



The Continental 314F-1 helped KHVN send a new format over the air with a brighter high frequency response.

### USER REPORT

our daytimer was a full-time radio station with 1000 W daytime and 280 W at night.

That same year we decided to stop simulcasting the urban format of our sister FM, and to begin our own black gospel programming.

As the popularity of the station grew to match our new extended hours and coverage, management realized the need to modernize. As a result, in March 1990, we found ourselves in a new building with a new transmitter ordered—the Continental 314F-1. I had never worked with a Continental solid state AM transmitter, so I wasn't sure what to expect.

#### A year later

It's been a year since we installed the new Continental transmitter. We have not been off the air for one second due to any transmitter-related cause. Our already low electric bill is now lower. Not only does the 314F-1 work well, but it sounds incredible compared to our old tube-type Collins. And the Collins was a good-sounding transmitter.

ters sounded good, but I never realized how good AM was capable of sounding until I heard solid state. The Continental

has given KHVN a cleaner sound with a brighter high frequency response.

I've also been impressed with the simplicity of the unit. It's basically just a T-network, a rack of solid state modules and a controlling panel all mounted in a cabinet. The exciter, transmitter control and power amplifiers are all mounted on plug-in modules for ease of handling and maintenance. Each MOSFET module employs on-board protection to prevent device failure from high temperatures, overvoltage or overcurrent conditions.

It doesn't even look like a transmitter inside—more like a computerized two-way radio. You pull the front panel off and there are the modules and that's it. It's just that simple.

#### Accessories help

We have found that using a "Y" configuration on our AC power is more stable than a Delta configuration. We are also using a lightning deterring device atop the tower. We are the tallest structure in the neighborhood, so if lightning were to strike, it would likely find us. The deterrent, combined with the cooperative help of Continental, has made this transmitting system very reliable.

We also are aided by an Optimod, which I think helps. And we quickly jumped on NRSC pre-emphasis.

Another advantage of the Continental solid state transmitter is that when we switch to low power in the evening, it doesn't go off the air for a split second. All of a sudden, you're just at lower power. When we used to change power, there was always the moment where you'd hold your breath, hoping it would come back on. I feel a little safer about that.

Another feature I like is the RFPWM modulation system, which offers pulse

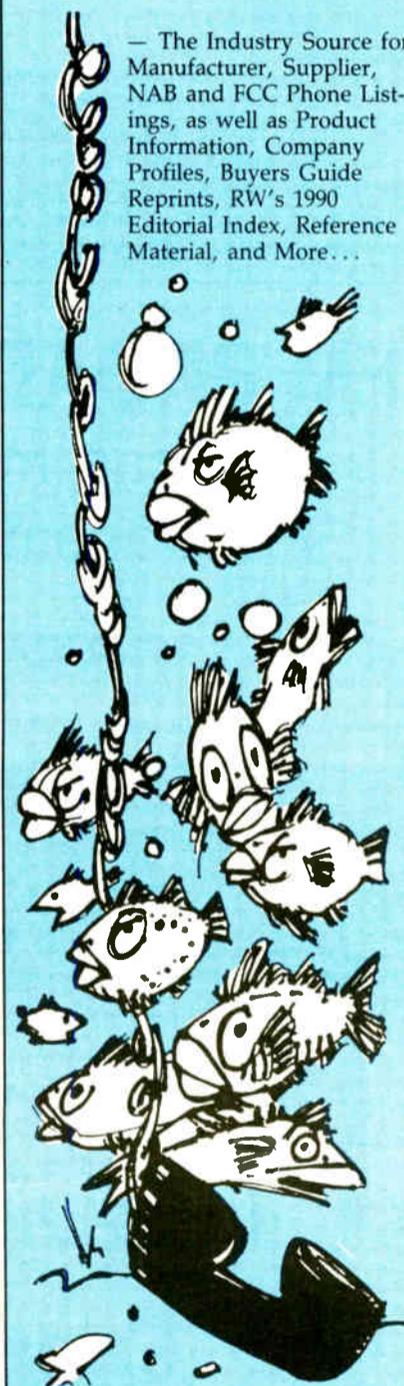
width modulation at the carrier frequency. Continental says this ensures the highest amount of sampling possible, resulting in audio response independent of the modulating frequency.

All in all, KHVN is doing well. With times as tough as they are, the station is highly rated and very profitable. We think the Continental 314F-1 has something to do with that.

For information on Continental's line of AM transmitters, contact Walt Rice at 214-381-7161; FAX: 214-381-4949; or circle Reader Service 57.

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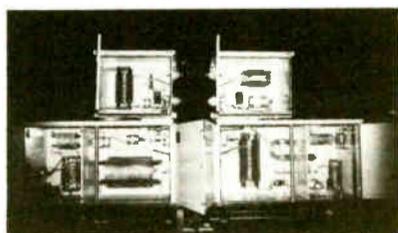


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World Radio History

# New Harris Gates I Impresses KWRT-AM

by Mark Lucas, Engineer  
RF Engineering Group

**BOONVILLE, Mo.** KWRT's Gates BC-IF performed very reliably year after year, but as time went by, it seemed that someday age would catch up with the big old unit.



Harris Gates I:  
Set for a 37-year run.

With a small town station like KWRT, new equipment doesn't come often. Good reasons are needed before replacing a piece of equipment. Fortunately, louder and cleaner modulation, a little better coverage and a lot fewer \$\$\$ on the utility bills made a lots of "cents" for Boonville.

When time came to retire the BC, it seemed only natural to replace it with a new Gates, the Harris Gates I. Six power levels, lots of metering, a diagnostic signal flow diagram right on the front, 72 percent efficiency, PDM modulation—the

list of features is long. It became obvious the time for replacement was now.

## Arrived on time

The Gates I arrived at the time promised—personally delivered on the back of our Harris salesman's pickup, no less. He pulled his jacket off and rolled up

## USER REPORT

his sleeves and four of us worked it inside. About an hour later, the jacket went back on and with a handshake, away he went. Wow, talk about old-fashioned advantages.

Now for the real fun. But wait. It was a piece of cake to set up. Ground strap and power into the bottom, the mod monitor feed in. Route the audio, screw the N connector onto the output and it was time for the smoke test.

Despite a little worry that the antenna load might not be flat, with a quiet little click, up it came. Tuning it in was really nice: just flip the metering over to see the VSWR and rotate it into the dip. (Analog meters are so nice for seeing exact dips).

Setting the three power levels was very

**People . . .** Crouse-Kimzey of Annapolis, Md., announced the addition of Richard Crompton to the staff for the Mid-Atlantic region. Crompton founded LPB, a manufacturer of consoles and carrier current systems.

**IDB Communications Group** has named Orlando (Lonnie) Guida, VP of corporate services. IDB is a provider of transmission services for radio, television and data/voice communications.

**Fidelipac** announced the addition of two to its staff: John Tiedeck (formerly with LPB) and Scott Martin, who will serve as director of sales.

**Associated Press** named Daryl Staehle director of sales and marketing for its broadcast services department. He will supervise sales and membership activities for AP's broadcast division. Staehle has been director for networks at AP Broadcast Services since 1987.

**The Broadcasters General Store** in

Ocala, Fla., named Dave Kerstin president and Bill Shute CEO.

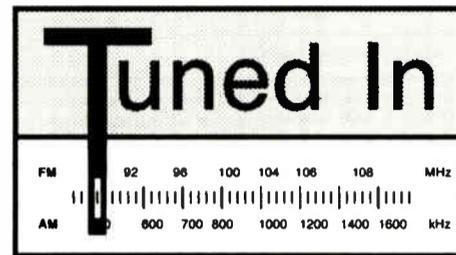
**Business . . .** Lexicon Inc., has selected Tandem Marketing as its representative for consumer audio products in Illinois, Indiana, Kentucky and Wisconsin. Essential Marketing was chosen to represent the professional audio line in Nebraska,

Iowa, Missouri, southern Illinois and Kansas.

**Bird Electronic Corp.** appointed Microwave Measurements Inc., of

Pleasanton, Calif., as its representative for sales to OEMs, industrial and calibration labs and the federal government in northern California.

**Harris Corp.** announced a plan to streamline its semiconductor business to increase profits. The semiconductor resources will be targeted into three major areas: Signal processing, power control and custom military and aerospace.



easy. Grab a small screwdriver and just watch the antenna current. And they didn't forget to make the mod monitor feed adjustable for each power level, either.

Servicing of the box looks real good, too. Pop the quarter turns off on the back and set the door aside—but where's the transmitter? There's not much in there, but what is there is done very nicely: component labels and numbered cables—all the stuff we've come to expect from Harris.

## Great big folder

But there is one thing new: A great big folder of schematics. And I don't mean a lot either. They're big in size, which makes things a lot easier than thumbing from page to page trying to remember which line you were trying to trace. Now if we could just get those

kind of schematics drawn up for the other Harris transmitters—especially for the HTs.

About the biggest problem with the installation was convincing the morning guy that it just clicks on. Instantly, with no warmup. And no, it really doesn't have to make any blower noise. And yes, when it's cold you may have to turn the building heater on.

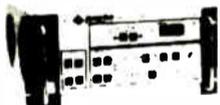
But to get to bottom line, the Gates I has been on line for several months now. The utility bills have really pleased management, coverage is better and it sounds great on the air. If this Gates is in service as long as our last one was, we'll shop again in the year 2037.

■ ■ ■

For information on Harris-Allied AM transmitters, including the Gates I, contact Ron Frillman at 217-222-8200; FAX: 217-222-7041; or circle Reader Service 72.

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# BUYERS BRIEFS

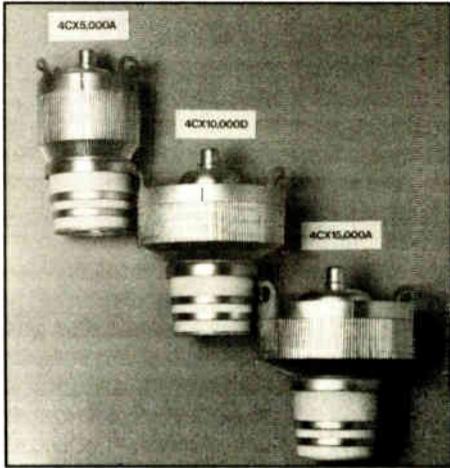
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EEV currently manufactures the following tetrodes for AM radio: the 4CX5000A 5 kW; the 4CX10000D 16 kW; the 4CX10000J 16 kW; the 4CX350000C 82 kW; and 4CW10000A 16 kW.

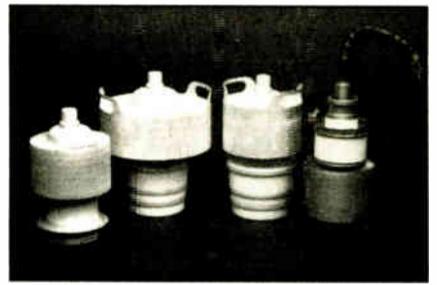
For information on the company's AM products, contact Perry Priestley at 914-592-6050; FAX: 914-682-8922; or circle **Reader Service 113**.



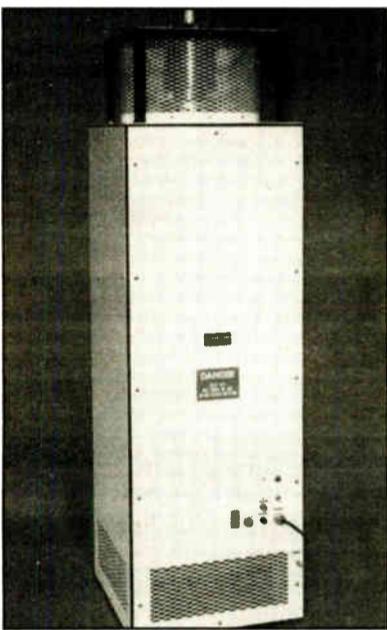
**WOODLAND, Calif.** Econco maintains it can rebuild a station's transmitter tubes at about half the cost of new tubes. All are rebuilt and tested to new specifications.

All tubes are covered by a 3,000-hour unconditional guarantee against defects in materials and workmanship. The warranty starts when the tube is installed, regardless of the purchase date.

Application and engineering support also is available.



For information on Econco's services, contact Debbie Storz at 916-662-7553; FAX: 916-666-7760; or circle **Reader Service 16**.



**NEPTUNE, N.J.** Electro Impulse Laboratory Inc., has introduced an improved version of its 50 kW load for both AM and FM with a frequency range of DC-110 MHz. The Model DPTC-50KFM is now smaller, lighter weight and has improved VSWR.

For information, contact Tom McNicholas at 908-776-5800; FAX: 908-776-6793; or circle **Reader Service 11**.



**SCHAUMBURG, Ill.** Motorola offers its Model 1400 C-QUAM AM stereo exciter, designed utilizing input from more than 600 C-QUAM AM stereo installations, as well as more than five years experience in AM stereo technical expertise.

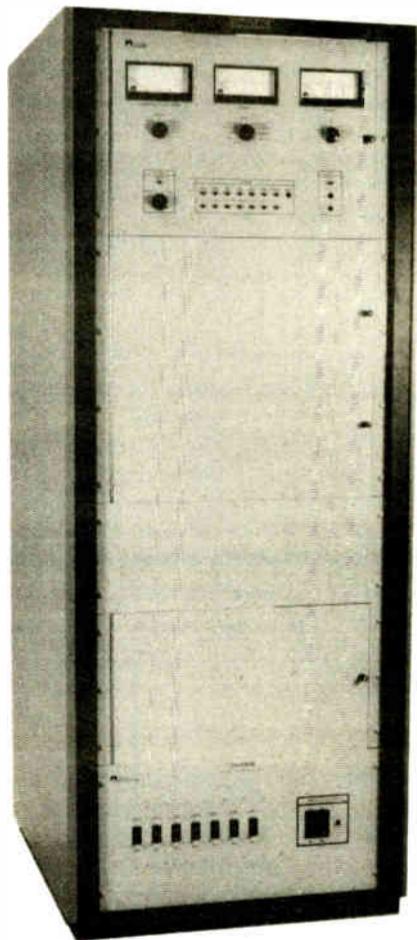
New features include front load circuit cards and front adjustments for easy removal and insertion of cards; front handles; and a motherboard to eliminate complex wiring harnesses. The 1400 also is functionally partitioned and includes remote stereo/mono switching and LED power supply status indicators.

There now are more than seventy 1400s in use around the world.

For information on the Motorola 1400 AM stereo exciter, contact Don Wilson at 708-576-3592; FAX: 708-576-5479; or circle **Reader Service 105**.



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# Energy-Onix Thinks It Through

by **Bernard Wise, President Energy-Onix**

**HUDSON, N.Y.** The major features of all Energy-Onix broadcast products are performance, reliability, attractive price and competitive operating expense.

Before deciding on the exact form and design of our AM transmitter, we wanted to examine and compare the two existing "state of the art" AM transmitter designs—the conventional high-level plate modulated transmitter and the high-efficiency PDM or equivalent modulated transmitter.

The results of this analysis of high-level plate modulated versus high efficiency PDM transmitters are as follows:

## TECHNOLOGY UPDATE

**Performance.** Both transmitter designs are capable of producing rated power outputs with performances far exceeding FCC specifications. The PDM systems provide better low frequency response with somewhat less distortion.

On the other hand, performance of PDM systems is much more dependent on the stability of the transmitter termination. Thus, multi-tower antennas and varying ground conductivity can cause difficulties with PDM transmitters.

**Reliability.** The PDM transmitters investigated were totally solid state. We concluded that special precautions such as unipole antennas, substantive grounding and major power line surge protection be incorporated in any PDM transmitter installation. PDM systems, in general, function reliably when users invest in the necessary antenna and power line accessories.

High-level modulated transmitters normally use vacuum tubes in both the PA and modulator stages. These tubes and their components have been in use for many years and have been refined to be reliable under normal operations.

**Attractive price.** Reviewing the manufacturing costs of both designs, we found that costs were comparable up to 1 kW, but at 2.5 kW and higher, despite the higher cost of modulation components and "Richardson" vacuum tubes—the sole source for EIMAC tubes—high-level modulation transmitters can be offered at list prices that are 20 percent to 50 percent lower than competitive PDM solid state transmitters.

**Operating expense.** The major operating costs of a transmitter can be classified as power consumption costs, replacement components and maintenance costs.

PDM modulator systems have efficiencies of 90 percent, compared to a 33 percent efficiency for high level modulation. The RF efficiency of both systems have comparable figures (80 percent to 85 percent). The average modulation with the compression used today is on the order of 65 percent versus 33 percent 20 years ago. Thus, at 10 kW output, a PDM system will draw 7 kW less than an equivalent high level system (approximately 50 cents per hour savings).

The increase in power tube costs that occurred when Varian formed an exclusive marketing arrangement with Richardson has influenced the establish-

ment of a number of reputable organizations who rework vacuum tubes.

Therefore, high-level AM modulated tube costs can be based on "rebuilt tube prices."

PDM solid state modules exposed to normal lightning and line voltage surges have a replacement component loss cost that compares to replacement tube costs.

**Servicing costs.** High-level transmitters are conventional, and trouble-shooting can normally be handled by the average radio engineer. Solid state PDM systems may require specialists who are not readily available.

Although high efficiency solid state systems offer attractive power consumption savings, we at Energy-Onix concluded that this benefit is offset by the greater initial capital investment, together with potentially higher engineering and maintenance costs.

Thus, after months of investigation,



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Energy-Onix decided to initially offer a line of high level AM broadcast transmitters with power outputs of only 2.5 kW, 5 kW and 10 kW.

The comparatively inexpensive 3CX-2500FC, is the one tube type used in these three transmitter models. Two 3CX2500FC tubes are used in the modulator for all 2.5 kW, 5 kW and 10 kW transmitters. One 3CX2500FC is used in the 2.5 kW and 5 kW for its power amplifier, while the 10 kW AM utilizes two triodes in the PA.

The RF and audio drivers are solid state. The control system is identical to the "universal" incorporated in Energy-Onix FM transmitters. This system incorporates the time delay, overload recycling, interlock and remote control facilities. Standard override switches are provided for all major control functions. Power supplies are conventional full wave rectifiers with appropriate LC filters.

In addition, no extraordinary investments are required in the grounding systems, power line protection and antenna modification.

■ ■ ■

For information on Energy-Onix, contact Bernard Wise at 518-828-1690; FAX: 518-828-8476; or circle Reader Service 136.

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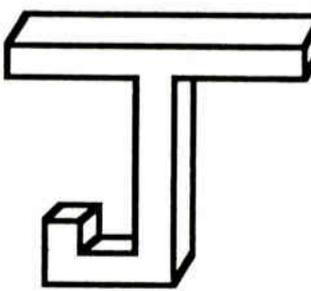
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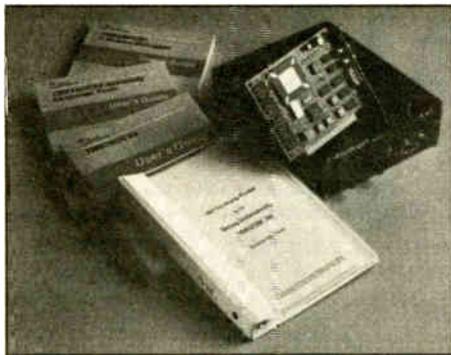
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# MARKETPLACE

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



### Developer's toolkit

The Ariel Corp's C30 developer's toolkit is a development system for the Texas Instruments TMS320C30 floating point DSP coprocessor.

The C30 includes an assembler/linker, C-source level debugger and library of application programs for spectral analysis, image generation and audio recording.

For information on the coprocessor, contact Les Listwa at 908-249-2900; FAX: 908-249-2123; or circle Reader Service 130.

### SCADA module

The CPI-232-M supervised control and data acquisition module (SCADA) from Computer Power Inc., performs computerized supervision and maintenance of any remote system in need of monitoring from a distance.

Transducer sources send pressure, temperature, voltage, current, frequency, pH and standing wave ratio data to the CPI-232-M, which connects directly to a computer or remote center through a modem. If alarm conditions are detected, a testing routine is automatically terminated.

For information on the SCADA, contact Cheryl Floystrop-Borne at 908-638-8000, ext. 173; FAX: 908-638-4931; or circle Reader Service 51.

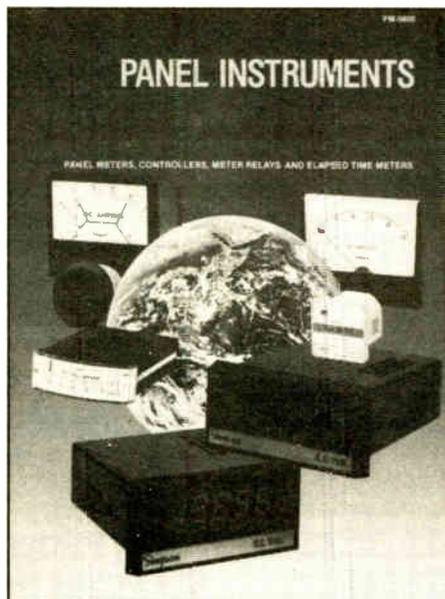
### Personal monitor

The Nardalert personal monitor from Loral Microwave-Narda is a sensor against being illuminated inadvertently by high power radar, communication systems or electronic warfare systems.

Nardalert allows continuous RF and microwave safety monitoring from 2 GHz to 18 GHz for personnel who work in a potentially hazardous area, but need a hands-free, unobtrusive monitor.

Housed in a small, wearable pocket-sized package, Model 8840B Nardalert features thermocouple-based detection for true RMS average field sensing.

For information on Nardalert, contact John Coppola at 516-231-1700; FAX: 516-231-1711; or circle Reader Service 142.



### Instrument catalog

Simpson Electric has introduced a catalog describing its selection of analog and digital panel meters, meter relays and controllers. More than 2,000 stock ranges, sizes and styles are featured.

Digital panel meters included are both AC and DC measuring tools. Analog AC and DC panel meters include Wide-Vue, Century, designer, segmented scale and round and rectangular models. Analog pyrometers, controllers, edgewise instruments and accessories also are featured.

For information on the catalog, contact John Deichl at 708-697-2260; FAX: 708-697-2272; or circle Reader Service 118.

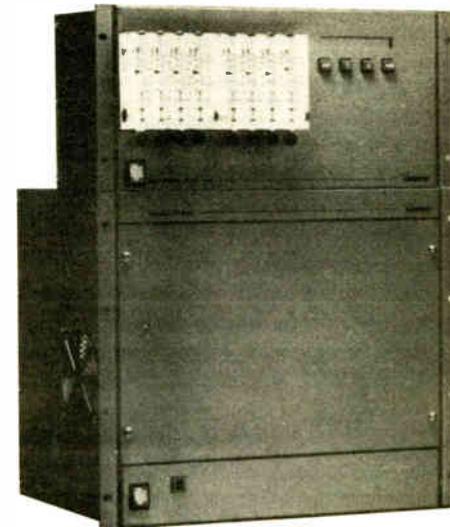
### Digital processor

Cutting Edge Technologies has announced the Unity 2000 digital processor—a complete digital FM processing chain in a single chassis.

The system features digital wideband automatic gain control, providing a consistent input level to the entire audio processing system, along with a low frequency equalizer and digital preprocessor/leveler.

Also included are a digital four-band limiter, clipper/filter module, digital stereo generator and digital composite clipper.

For information on the Unity 2000, contact Joe Foti at 216-241-3343; FAX: 216-621-2801; or circle Reader Service 47.

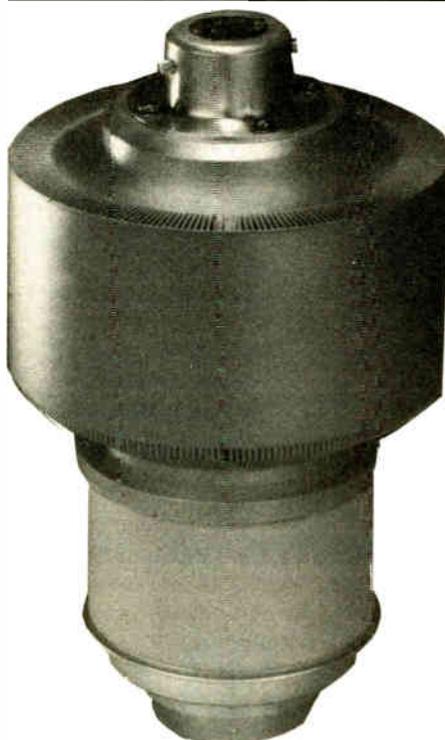


### Dehydrator

The DryLine dehydrator from Andrew Corp. is available in two series, the XT and the MT, for pressurizing transmission lines.

DryLine is in a two-chassis, rack-mountable package and is microprocessor controlled.

For information on the dehydrator, contact Jerry Tuttle at 708-349-3300; FAX: 708-349-5943; or circle Reader Service 83.

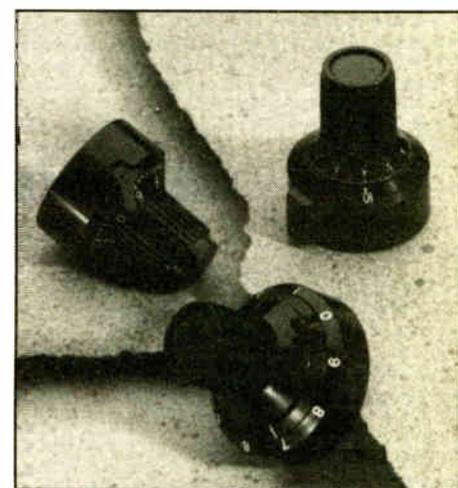


### Air-cooled FM tetrode

Thomson Tubes Electronics has announced the TH 346 60 kW air-cooled tetrode. Thomson tetrodes are suitable for linear amplifiers operating at up to 120 MHz.

The tetrodes are composed of ceramic and metal in a coaxial structure. Pyroloc grids are used for high operating stability.

For information on the tetrode, contact Helene Maggiar at +33-1-49-09-28-28; FAX: +33-1-46-04-52-09; or circle Reader Service 79.



### Turn counting knobs

The complete line of turn counting knobs from Rogan Corp. is available with machined aluminum or plastic bases for use with multi-turn potentiometers.

All knobs are either black with white markings or gray with black markings.

For information on the knobs, contact Don Pelletier at 708-498-2300; FAX: 708-498-2334; or circle Reader Service 6.

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# Kintronic On the Money

by W.C. Alexander, Dir. Engineering Crawford Broadcasting Co.

**DALLAS** In early 1989, Crawford Broadcasting Co. was granted a construction permit to build a new full-time AM facility on 770 kHz here in Dallas.

With a target date of Dec. 1, it was a scramble to get a design completed and solicit bids from all the manufacturers for an antenna phasing and coupling system. When the bids were all in, the contract was awarded to Kintronic Laboratories.

## USER REPORT

The Dallas facility was to begin life as a four-tower, 5 kW day/1 kW night array, but a change was in the works. An application had been filed with the FCC to increase daytime power to 10 kW with the addition of a fifth tower. This complicated the design and burdened the manufacturer with the task of building the phasor in a way that the change would cause minimal fuss.

Before the towers were completely finished, the phasor and ATUs arrived by dedicated truck. Each cabinet had been individually crated and was packed in such a manner that there was no shipping damage. The crates were marked, so we had no trouble identifying the contents and unpacking them.

### On the money

Dimensions supplied by Kintronic Labs for the mounting tabs on the ATU weatherproof housings were right on the money. A template was constructed using these figures so that the supports could be placed in advance; when the ATUs arrived, they fit the mounts like a glove. Likewise, a hole had been left in the dividing wall in the transmitter building in which to place the three phasor cabinets. The cabinets fit perfectly.

Drawings of the control circuitry were complete and well made. Hookup, while time consuming because of the complexity, was problem-free.

RF plumbing was as easy as it could be. The cable clamps, which are manufactured by Kintronic Labs, were much easier to deal with than EIA flanges, "spark plugs" or other common line terminations. They securely terminate the transmission line with a good mechanical and electrical connection. In fact, I liked these terminations so well that when I ordered my next transmitter for the company, I had it equipped with one as the output connection.

### Another novel product

Another novel Kintronic Labs product is its portable RF ammeter/transformer. It is really a Delta transformer/meter combination mounted on a self-contained insulated platform. To read base currents, I take the ammeter to the ATU and plug it into a parallel J-jack. The shorting J-plug is then removed and the current read on the meter. This device yields all the advantages of using a Delta ammeter at the tower bases.

Since one meter is used for all towers, ratios are more accurate than if multiple meters are used. The cost, obviously, is much lower than if a meter is permanently installed in each ATU and the meter/transformer combination can be stored inside the transmitter building.

Kintronic Labs manufactured all the RF components in the phasor with the exception of capacitors; the components were of excellent quality and reasonably easy to adjust. Roller inductors worked well, with the exception of one 40-amp tubing roller that had a sticky spot. This turned out to be foreign matter in a bushing; a thorough cleaning and lubrication with silicon grease made it smooth and easy to turn.

When completely assembled, the system performed as advertised. There were no mistakes in construction or documentation; the phasor and ATUs were exactly as

I had envisioned them.

We finished the installation in mid-November 1989, and the DA tune-up and proof took a few more weeks. We were a couple of weeks late, but it didn't matter—for other reasons, the sign-on date was moved to April 1990. We signed on then with the four-tower, 5 kW array.

In June 1990, we had the CP for the change to 10 kW for the daytime array. The fifth tower was erected and we went back to work tuning up the DA.

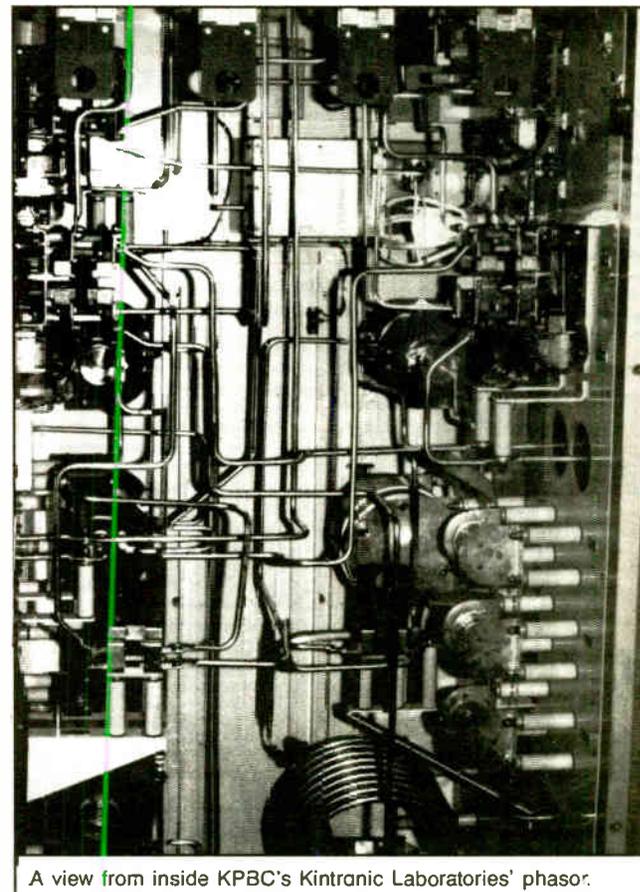
Kintronic Labs had made provisions for this change in its construction. It was necessary to jumper several components, unjumper several others and generally reconfigure for the new array. We did this in one night with the tubing, strap and other parts provided by Kintronic Labs. Tune-up of the new array was a snap.

### Like a Rolls

The quality of the work turned out by the people at Kintronic Laboratories is

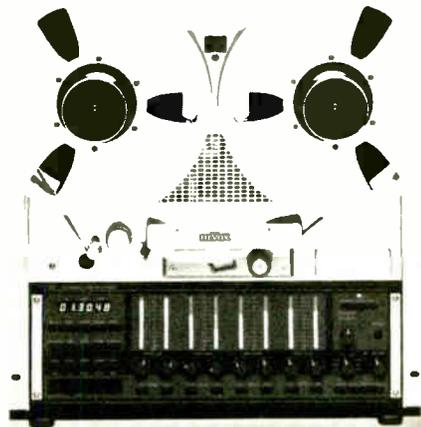
tremendous. I would liken the products to a Rolls Royce automobile—the equipment and components all are handmade by people that obviously care very much about the quality and appearance of their product. There are no gaps where panels come together, the two-tone blue paint scheme is very attractive and the etched

(continued on page 38)



A view from inside KPBC's Kintronic Laboratories' phasor.

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# Nautel a Hit in Dallas

(continued from page 26)  
provided for whatever the user wishes to use it for. We use it to kill the transmitter if a phasor door is opened.

The transmitter is modulated using pulse-width modulation (PWM), common to the majority of current generation transmitters. Audio quality is excellent and stereo performance is great. An external RF drive input is provided on a BNO connector. Nautel went to great lengths to keep incidental phase modulation (IPM) to a minimum, and an active IPM correction circuit is an integral part of the transmitter.

Two separate exciters are standard. Each can be configured independently for internal or external RF drive. The active exciter is selectable by front panel control or remote control.

Each 1.25 kW subsystem contains three power modules; each contains two H-bridges using four IRF-140 Power MOSFETs apiece. That makes for almost 200 MOSFETs in the whole transmitter, which scared me at first. But after a year of 24-hour operation, I have had only one MOSFET fail (for an undetermined reason). The protective circuits shut down the offending module and illuminated a front panel LED, telling me which module in which cube had the problem.

One of the strong points of the Nautel AMPFET ND-10 is that the cubes can

be removed and serviced without leaving the air. The desired module is switched off and bypassed with rear-cabinet mounted toggle switches, then removed for service. After repair, the procedure is reversed, all with the transmitter operating at only 1.25 kW below full power.

Isolating a defective MOSFET is a snap, as is removing a module from or installing one in a cube. Believe me, this is the closest I have come to having a transmitter repair itself.

I have dealt with Nautel's customer service department on a couple of occasions, both when needing some information on something or another. The engineers there are competent, considerate and available when you need them. Parts are stocked in Nautel's Bangor, Maine, office for quick shipment to U.S. destinations.

After running the Dallas transmitter all summer, we liked it (and our utility costs) so much that we bought an identical AMPFET ND-10 for our Los Angeles station. Both are humming right along. For any future AM transmitter needs, Nautel will be our first choice.

For information on Nautel products, contact Jorgen Jensen at 902-823-2233; FAX: 902-823-3183; or circle Reader Service 127.

# Kintronic On the Money

(continued from page 37)  
aluminum label plates on all the controls and components are first-rate.

While that phasing and coupling system has been in service for more than a year now with no problems, the phasor at our Los Angeles station had been in place since the early 1950s. It was time to replace the old Gates radio unit and the ATUs with new equipment and we were so happy with the Kintronic equipment in Dallas that no other manufacturers were even considered for the L.A. job.

The phasor and ATUs arrived in good

condition and met our high expectations. Every component was correct with respect to our design and specifications. Installation was a snap and went according to plan. We are very happy with the system.

As this company continues to grow, when the need arises for phasing and coupling equipment, you can bet we'll be calling Kintronic Laboratories.

For information on Kintronic Laboratories products, contact Tom King at 615-878-3141; FAX: 615-878-4224; or circle Reader Service 67.

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# Wheatstone's Bright Idea!

## *Just When You Thought All Furniture Was Alike*

We've wedded the latest precision NC metal components to high grade solid wood trimmed laminated panels and counter surfaces. Added to this design breakthrough is the implementation of true 1-1/2" thick counters and vertical structural panels that put an end to warping, racking and delaminating problems. What's more, our wood trim comes flush to the counter surfaces to eliminate exposed laminate edges (so tempting to idle hands). In fact, the counters are separately trimmed to eliminate unsightly and short-lived formica seams.

Naturally, with all of our experience at building and interfacing consoles, we've worked out the details: like convenient hinged down punchblock panels for easy installation and maintenance, really generous cable pathways between enclosures, and equipment turrets with both back and side door access. Our rackmount base cabinets have mount-

ing rails on both sides, so equipment can be mounted any way desired or even switched at a later date. Concealment doors can be placed on cabinets intended for future electronic installation. Continuous length floor risers assure even cabinet-to-cabinet alignment. We've even included heavy duty ground bonding terminals.

This furniture family is complete, with both stand-up and sit-down versions, angled equipment turrets in two heights (with or without risers), concealed, fully isolated turntable cabinets, auxiliary wallmount equipment cabinets, wall and cabinet mount cart and CD storage, utility and file cabinet pull-out drawers, reel-to-reel tape deck mounts, interview counters—practically anything you can imagine. With this much variety, Wheatstone's rock solid construction and major market look, there really is no comparison.

So contact Wheatstone, the people with the reputation and expertise you can count on.



 Wheatstone<sup>®</sup> Corporation

*Furniture*

6720 V.I.P. Parkway, Syracuse, NY. 13211 (tel 315-455-7740/fax 315-454-8104)

Circle 55 On Reader Service Card

World Radio History

# *The Closer You Get...*

**WE MEAN IT**—we really DO provide the quality, performance, technical support, and innovation we promise!

Our model A-500 is a thoroughly engineered on-air console: it delivers the level of performance your clients now expect, and DAB demands. All components are selected for long life—gold bus connectors, gold I/O connectors, all gold contact switches, gas-filled relays, triple burned-in integrated circuits, solid state ON/OFF lamps, and precision laminated Lexan control surfaces for a lasting, wearproof finish. And we back that up with a 3-year parts and labor warranty, complete with

factory support from a technically competent and responsive staff.

We've also handled your special requirements as well with a super family of accessories, including a choice of three different telephone modules, an intercom module, an off-line mixer module for your remote feeds, talent control stations, accessory panels, failsafe power supplies, and auto cart and CD sequencing options.

**So take a close look:** we've got the quality, we've got the innovations, and you've got our commitment to top-notch support.



# *The Better We Look!*

*A-500*