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Radio World®

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Running Radio
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OET's Smith Controls the Forces of Change

by Alan Haber

WASHINGTON Do not expect the expected from Dick Smith while he is at the helm of the Federal Communications Commission Office of Engineering Technology (OET).

You might assume that after three decades with the same governmental agency, Smith, who just celebrated his 55th birthday, might be calculating his tenure with Uncle Sam.

Not hardly, in both action and opinion.

"I do not want to sit here and just wait for something to show up in my in-box," he said. "I want to get out there and find out what is going on."

After 32 years with the FCC, Richard M. Smith finds himself at the ten-month mark in what he calls his "second career," chief of OET.

It is a job with a charter he takes very seriously—and very un-bureaucratically.

Smith is reacting head on to what he calls the "explosion of technology" in the radio spectrum arena.

"There is some wonderful technology out there," Smith said. 'Digital is the key word here. We are rapidly moving from an analog society, technically, to a digital society. This has tremendous ramifications.

Encouraging development

"What we want to do here is to make sure that this technology is in fact made available—that we, the FCC, are not in the way of its development.

"We want to encourage development of new technologies, as they relate to radio uses. We want that to translate into competitiveness for the American consumer."

OET Chief Richard Smith

The timing is precise, Smith said.

"I feel like I have arrived at just the right place, just in the nick of time, to make a contribution to this explosion of technology in the radio spectrum arena."

Bird's eye

His bird's eye view at the commission makes him optimistic about the possibilities of the future.

"I think just like the movies did not go out of business when television came, and radio broadcasting did not go out of business when television came on board, there is room for all of these technologies—at least most of them," he said.

Competition, increased productivity and creation of jobs are cumulatively beneficial to the country in Smith's opinion.

For example, consider the impact of satellite digital radio on terrestrial radio.

"I don't think that satellite digital radio, personally, is going to have any particularly great impact on terrestrial radio. I

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FIRST PERSON

Oklahoma Rescue Documented by BBC

by Ted Tait

OKLAHOMA CITY We all know that being a radio engineer means being available on short notice to take care of problems and emergencies.

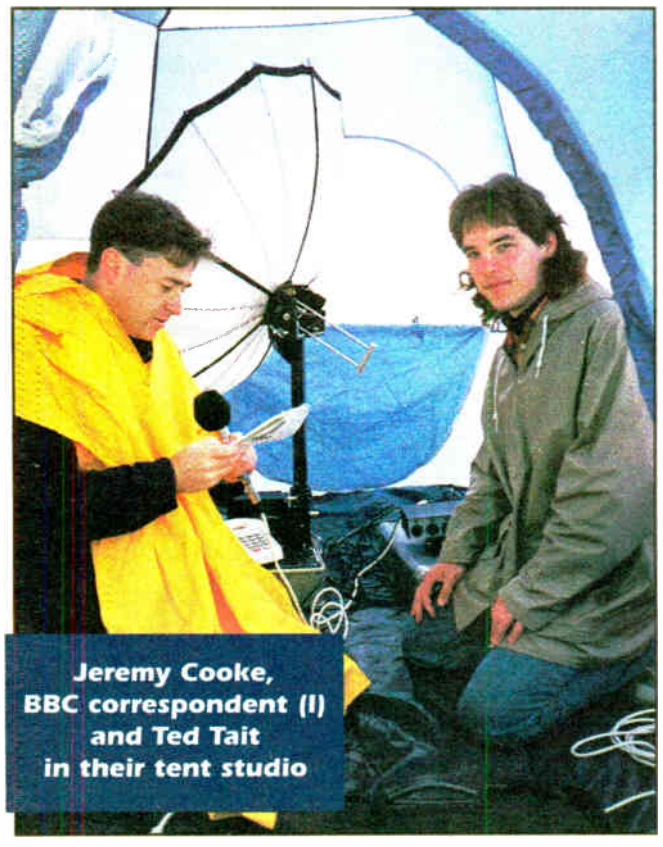
In the radio news business, it seems to go a step further.

Wednesday, April 19: I was spending the third day of what was to be a two-week vacation from my post as chief engineer of the British Broadcasting Corp. (BBC) Washington Bureau enjoying one of the first summer-like days, when my pager went off.

There had been a major bombing in Oklahoma City. A BBC producer already on-site wanted to broadcast back to London in better quality than a cell-phone. The producer in Washington relayed the message to me:

"Can you get a high-speed data sat-phone today and be on a plane to Oklahoma tonight by 7 p.m.?" she asked.

Suddenly, my day took a radical turn.



Jeremy Cooke, BBC correspondent (l) and Ted Tait in their tent studio

A few blocks away

I went to the bureau just a few blocks away to make some phone calls about the availability of sat-phones and gather the other gear I would need. It was already 3:30 p.m.

Satellite telephones are an interesting technology, available in a variety of sizes and styles. Essentially you set up the sat-phone anywhere you can get a clear shot of the Southeastern sky to aim at one of several satellites and start making calls, much like any telephone—except that it is much more expensive, of course.

The Washington office has used units with phone-quality audio, called M-Terminals, or units with available high-speed data, simplex or duplex 56 kb known as A-terminals.

With an A-terminal connected to a 56 kb codec, such as the CCS Micro-56, and a

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World Radio History

NEWSWATCH

SBE Forms New EAS Committee

INDIANAPOLIS The Society of Broadcast Engineers (SBE) announced the formation of the SBE Emergency Alert System (EAS) Committee. Leonard J. Charles of Madison, Wis., was named committee chairman. According to Charles, "Our primary mission is to educate, our primary concerns are technical. This new emergency alert system will enable our members, and the industry to more effectively save lives and assist the public in times of disaster.

"The SBE must and will step up to the plate to help guide the implementation of the system in a cost-effective manner."

SPARS Restores Recording Code

HOLLYWOOD, Calif. The Society of Professional Audio Recording Services (SPARS) reinstated the SPARS recording code on prerecorded audio software, such as CDs, cassettes, LPs, etc. During a span of several years in the mid-to-late 1980s to the early 1990s, the SPARS code could be found on albums based on the recording technology. For example, an all digital recording would be signified by a DDD—indicating digital recording, mixing and mastering.

In 1991, however, SPARS pulled the code because of a fear that consumers were using it to rate quality of the recording: i.e digital is better than analog. The restoration of the code was made because of "an unprecedented degree" of advancement by both digital and analog technologies, and that the "code serves a worthwhile function in accurately documenting the process of audio recordings."

Major Increase In Radio Ad Sales

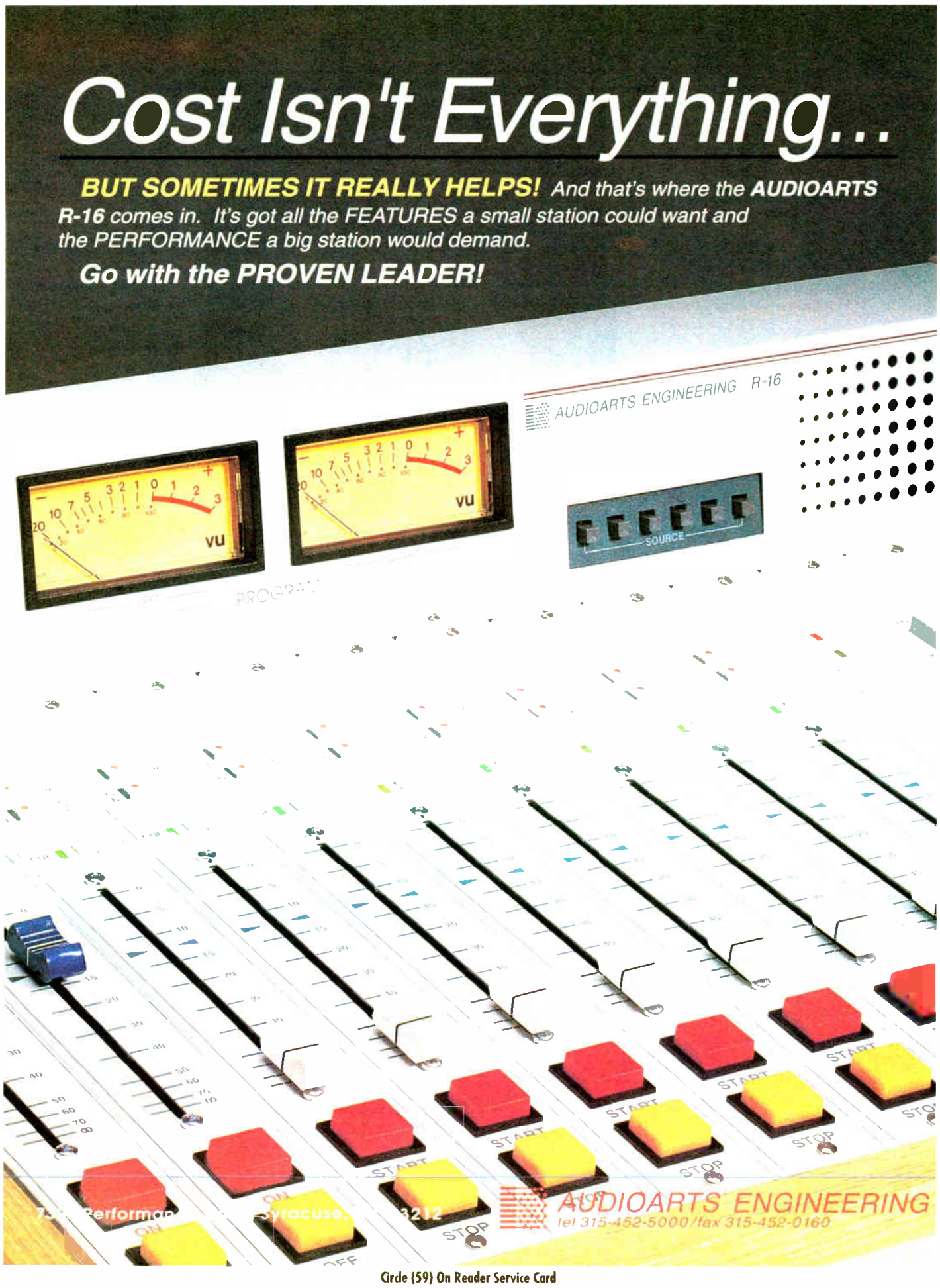
NEW YORK Local and national radio ad revenue grew by 13 percent in the first quarter of 1995, a 13 percent increase over the first quarter in 1994, according to the Radio Advertising Bureau. "Radio's 13 percent growth in the first quarter puts us in the enviable position of starting the year on a rock-solid footing," said RAB President Gary Fries.

Fries noted that the growth is unlikely to be sustained at such a rate, but "there's no reason to expect anything other than steady growth in the low double and high single digits as we head into summer."

Temporary Relief for Public Broadcasters

DATELINE On May 12, a House-Senate conference committee voted to fund the Corporation for Public Broadcasting (CPB) $275 million for fiscal year 1996 and $260 million for fiscal '97.

The vote came as a relief to public broadcasters, who were expecting funding cuts of up to 30 percent. In March, the House voted to reduce CPB's appropriation to $265 million in fiscal year '96 and $221 million in fiscal '97, down from $312 million and $315 million, respectively. In April, the Senate voted to freeze CPB funds for the next two years at $285 million, the fiscal '95 level. Congress is considering long-range funding plans.



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Fidelipac Emerges from Bankruptcy

by Mark Hallinger

MT. LAUREL, N.J. After nearly a year in Chapter 11, Fidelipac has emerged from bankruptcy under the terms of a reorganization effective May 5.

"As of May 5 the company is no longer operating under the provisions of Chapter 11," said Fidelipac President Roger Thanhauser.

Thanhauser said Fidelipac's business was not adversely affected by the late May 1994 Chapter 11 filing, though this was a concern when the company filed.

"I was concerned prior to the filing that it would impact our business... we would have done almost anything to not file," Thanhauser said. "But our business has actually remained totally constant."

According to Thanhauser, Fidelipac filed for protection under the provisions of Chapter 11 last year primarily because a dispute with the company's landlord threatened to mushroom into a $500,000 lawsuit.

Thanhauser said the possible lawsuit forced Fidelipac to turn to Chapter 11, which allows a company to continue doing business while offering protection from creditors and relief from existing contracts such as leases.

Fidelipac, a 35-year-old manufacturer of analog cart machines, tapes, mixing consoles and a newer line of digital products, ran into trouble with its landlord regarding a renewal notification clause of the lease.

While Thanhauser and the company's real estate agent believed they were obligated to notify the landlord of renewal six months before the lease ended, a forgotten side letter stipulated that a six-month notification also was required for termination or the lease would automatically renew.

At the time Fidelipac was planning to move into a new, smaller building to cut overhead costs. Although Fidelipac attempted to negotiate a new lease for less space in the months prior to the Chapter 11 filing, an agreement could not be reached.

Thanhauser said the 30,000-square-foot building Fidelipac occupied had become unnecessary when the company decided to discontinue manufacturing magnetic recording tape.

With no new lease agreement in sight, Fidelipac's attorney recommended Chapter 11. This avoided a potential judgment that could have required the company to pay $400,000 to $500,000 for three years of accelerated rent and legal expenses.

Fidelipac moved into a smaller building in June 1994 after the filing. This move reduced overhead costs by about 50 percent, said Thanhauser.

Chapter 11 did not affect Fidelipac's major product release of 1994, the Dynamax DCR1000M/O Series of digital cart machines.

□□□

Mark Hallinger is news editor of ***RW*** *sister publication TV TECHNOLOGY.*

Funding Debate Rages On

by Whitney Pinion

WASHINGTON The road to self-sufficiency should be paved with a tax-exempt trust fund—or at least that is what public broadcasting officials hope.

What others want, however, may be a different story.

As debate continues on the fate of federal funding for public broadcasting in the United States, numerous alternatives are sure to surface.

The question is, as one congressional spokesperson suggested: "How can we keep public broadcasting going without tapping into the public purse?"

Taking a first step were the presidents of America's Public Television Stations (APTS), National Public Radio (NPR), Public Broadcasting Service (PBS) and Public Radio International (PRI) who submitted a joint proposal to Congress in early May.

The proposal is a response to Congress' suggested spending cuts of 16 percent in 1996 and another 30 percent in '97, and the elimination of federal appropriations for public broadcasters after '97.

Public broadcasters are being challenged to operate more efficiently, said NPR President Delano Lewis. "We have to look at restructuring and doing things differently in times of fiscal austerity," he said.

To put public broadcasting "on the road to self-sufficiency," these organizations proposed the establishment, by Congress, of a tax-exempt trust fund similar to those set up for the Red Cross and Little League Baseball. Federal appropriations would diminish annually in direct proportion to the annual income produced by the trust fund.

Money for the trust fund would come from a number of sources, including the lease of reserved but unused noncommercial spectrum (which would require statutory and regulatory changes), a percentage of spectrum use fees, proceeds from spectrum auctions (which currently are directed to the Treasury) and contributions from commercial broadcasters in exchange for relieving them of various public interest obligations.

These organizations estimate that somewhere between $3 and $5 billion would need to be funneled into the trust fund to generate the $300 million necessary to replace federal funds.

When asked how realistic the proposed funding ideas are, David Brugger, president of APTS, said that he and the others were asked to suggest possibilities. "We are public broadcasters, not politicians," he said.

And what will Republicans make of the proposal? "Republicans may not like it, but we're putting it back in the hands of Congress to start a dialogue," said Lewis.

David Kohn, spokesman for Rep. John Porter (R-Ill.), chairman of the House Appropriations Subcommittee on Labor, Health & Human Services, and Education, said it is important to have this input from public broadcasters. Although the trust fund proposal "is not laughable," Porter and others have to ask if it is "politically feasible," Kohn said.

In a statement released the day of the press conference, the National Association of Broadcasters (NAB) said that although it is "sympathetic to public broadcasters' plight," it has "no interest in assuming the financial responsibility for their so-called self-sufficiency plans."

Congress is looking for common ground between those who value public broadcasting and those who want to see it function without federal funding. Kohn said that he expects Congress to reach a consensus about public broadcasting's future and its funding within the next several weeks.

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Digital Radio: Just Rocket Science?

CLEVELAND The van, loaded with reporters and editors, pulled up in front of the brown, smallish building that was attached to some sort of gigantic dryer-exhaust-like tubing made of high-grade metal. As we piled out of the van and headed into "Building Eight by Six Foot Supersonic Wind Tunnel" for a briefing, I couldn't help but laugh. What kind of a name is that for a building? A very NASA-like name to be sure.

Although there is indeed an eight-by-six-foot supersonic wind tunnel attached to the building, the laboratory conducting the testing of the nine systems from the five proponents of digital audio radio is located in the basement. Ah well, maybe Disney World has a supersonic wind tunnel ride....

Anyway, the Electronic Industries Association (EIA)-sponsored gathering and tour for the press was rather astonishing. I mean, we all know that EIA is sponsoring testing of the systems (IBOC systems testing is co-sponsored with the National Association of Broadcasters-NAB) and that the NASA Lewis Research Center is the site, but you never really understand what that implies until you see it.

First off, my own experience with NASA (my dad has been an engineer there for 30 years) predisposes me to assuming they are methodical, precise and objective. The center itself was established in 1941 by the National Advisory Committee for Aeronautics (NACA). It was one of three such centers in the country. The Lewis Center developed an international reputation for its research on jet propulsion systems, and in 1958, the three NACA centers became the nucleus of the National Aeronautics and Space Administration (NASA).

In addition to testing the digital radio systems, the Lewis Center is conducting tests for NASA's high speed research program in the areas of combustor design and enabling propulsion materials, technologies to support advanced short take-off and vertical landing aircraft, and is managing the Advanced Telecommunications Technology Satellite.

In addition, James Bagwell, deputy chief of the space communications division at Lewis, explained that the center has been involved with digital audio radio since 1988, when it worked with the United States Information Agency looking to develop digital radio for Voice of America. It also was involved in the sub-

In the sound booth...

jective evaluations of HDTV and is scheduled to participate in the study and development the National Information Infrastructure as it involves standards and operability.

What it all means is that these people know how to conduct tests. Every piece of wire, every plug, every connector, every instrument involved is measured, calibrated and identified so that if one tiny little thing were to go wrong, it could be replaced, calibrated to the correct spec and the tests could continue. Also, when the field portion of the tests begins (more on that later), the equipment now in the lab has to be used in the field.

Pictured l to r: Al Resnick, James Bagwell, Gary Shapiro and Ralph Justus

It goes without saying, this is one secure place.

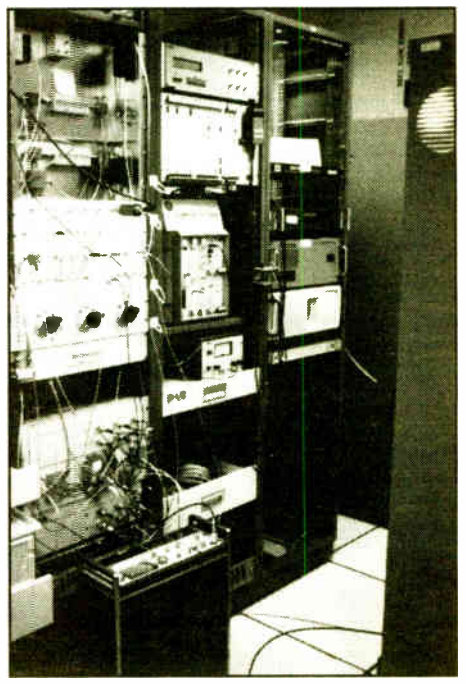
The lab uses nine source pieces of audio selected to challenge the systems (as of yet unidentified and to remain so until the test results are released). As each test is conducted on each system, a recording is made to DAT. That material is being shared with the Communications Research Center (CRC) in Ottawa that is conducting the subjective testing portion of the tests.

Among the things these engineers listen for is the threshold of audibility (TOA). TOA is reached when the audio starts to audibly degrade when subjected to certain stresses (like noise, co-channel interference, multipath, etc.). Listening and data gathering continues until POF, or point of failure, is reached. Exhaustive measurements, day after day after day. Mountains of data gathered and compiled.

And while the top brass, including EIA's Gary Shapiro, Capital Cities/ABC Inc.'s Al Resnick and Bagwell continually made reference to the "Spartan" lab (especially in comparison to the Advanced Television Center) I kept thinking—NASA scientists mean business. Who cares if there is no glitz (although I really wanted a look at the supersonic wind tunnel). There is no doubt in my mind that the testing methodology, accuracy and fairness is legit. It has to be. Proponents can do all the political jockeying they want, but the tests have to be beyond reproach.

Each proponent will receive its test results three weeks prior to the tentatively scheduled August 24-26 Digital Audio Radio Workshop to be held in Monterey, Calif., at which time the lab results of all proponent systems will be released in a public forum.

Field tests to be conducted in San Francisco are tentatively scheduled for completion by end of third quarter 1995. The subcommittees (EIA's DAR Subcommittee and the National Radio Systems



Two of the systems on the rack...

Committee's DAB Subcommittee) plan to report testing results to the commission with a recommendation of system(s) to be implemented.

Sounds good to me.

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World Radio History

GUEST EDITORIAL

Closer Look Reveals EAS Better in Many Ways

by Fred Baumgartner

DENVER As I page through my collection of articles attempting to explain EAS (the Emergency Alerting System that the FCC mandated as a replacement for the aged Emergency Broadcast System), I conclude that very little has been said about installing EAS, or the options and benefits that will come to broadcasters.

By the time you read this, the NAB will have come and gone. While there will not have been a single technical session on EAS, the SBE (Society of Broadcast Engineers) will have met to discuss its role in implementing EAS. Certainly there will also have been some discussions of how to "fine tune" the EAS protocol. With that, I think it is time to cover what EAS is and is not, and give a quick overview of the industries opportunities; which are many.

First, what EAS is not. It is not simply a better box to replace the older EBS box. It does not use the EBS daisy chain. It is not RBDS, however RBDS can and should serve an important role.

EAS was designed to be a fast, cost saving, highly useful and universal (broadcast, cable, satellite; local, state, national and even international, multilingual) alerting system. It is specifically tailored to allow (not require) electronic mass media to automate alert messaging, provide greater control over broadcast content and offer news operations support unavailable with prior technology. The end result is a saving of lives and property and a major improvement in broadcasters' ability to serve their audiences.

The protocol

EAS has two main elements, the network architecture and the signaling protocol. The signaling protocol is the most obvious trait of EAS and the subject of most press to date. It is, however, dwarfed in importance by the "WEB" network architecture.

Simply stated, the EAS signaling protocol calls for a digital message followed by a voice (and/or data, under some configurations) message. The digital "header" message is a highly compact and defined string of characters. The string of characters is divided into blocks that contain information about the nature of the emergency, the area affected, and the time involved. Each of these blocks of information is only a few characters long, each resembling an abbreviation. Each header message can be easily translated into any language; spoken, written, or signaled.

There are other "housekeeping" blocks of information that contain the date and time, originating agency, and other information necessary for the EAS decoder to work properly and with security. The header itself is sent on a slightly non-standard FSK (Frequency Shift Keying), in-band (you can transmit it via any voice grade channel or transmitter) carrier. Sending a very long header three times takes approximately eight seconds. A test can take less than a second.

The EBS header required 23 seconds and carried only this information: "The station you are monitoring wants you to listen for a message, probably a required test." By contrast, the EAS header contains all of the information necessary to decide how and when to route, broadcast, or dispose of the message.

But that is not where it ends. EAS is to EBS exactly what the computer is to the typewriter.

The Web

As I indicated, the real power in EAS comes from the Web network architecture. There are dozens of communication architectures available from the "round_robin" of radio days past to the mystical "token-ring" popular in computer networks. The Web is completely unique and tailored to EAS.

All networks connect "nodes" together. Nodes are the places where the information is entered into the network, where it is received for use, or where information is routed from one communication path to another. Certain nodes can be restricted to send only, receive only, or relay only (or any two of the preceding functions).

The most visible sign of the Web is that unlike the EBS decoder that has one input, the EAS decoder has a minimum of two inputs. Each EAS Web node receives information from two or more other EAS nodes.

If a node monitors four other nodes, it "sees" four other sources of information. If these four nodes then monitor four other nodes and pass the information along, the first node then "sees" sixteen sources of information. By the time the message reaches the third level, a very typical small EAS system that first EAS node will "see" sixty-four sources.

This exponential growth characteristic of the EAS Web can be used to provide direct access to broadcasters from many emergency agencies and to provide redundancy. In the EAS Web, about half of the interconnections should be made to provide redundancy and the others to provide access.

The EAS Web is a mathematical wonderland. Consider this Denver simulation. If all EAS nodes have four inputs, and they are configured as above and one-half of the broadcast and non-broadcast stations (nodes) are suddenly taken off-line, the EAS Web will still reach 100 percent of the survivors 90 percent of the time.

This is a far cry from EBS where taking a single station off-line, either because of a technical fault, or because the DJ was taking a break, could and frequently did result in total failure.

Denver has a number of emergency agencies that need access to broadcasters. There are military and nuclear facilities, the weather bureau, and we are noted for our winter road emergencies and flash floods. Like most metropolitan areas, each of Denver's suburbs also have emergency agencies and needs. Even more so, Colorado, as most states, has many rural and isolated areas in need of local alerting means.

Point of information

This is a good place to make a point. EAS is largely a local matter, with the design of the EAS Web almost entirely up to the individual SECC (State Emergency Coordinating Committee). It is entirely possible to design an EAS network that works almost as poorly as the EBS network. It is also entirely possible to use correction fluid on your computer screen.

Oddly enough, the SECC is composed of broadcasters and emergency personal. A little time spent now, designing a workable EAS Web will pay off handsomely. EAS does involve a learning curve, and like all learning curves, the benefits accrue to those who make the climb.

This is early in the industry's learning curve and most of us do not realize how much can be done with EAS and what it can do for us. Probably the biggest hot button that EAS possesses is the prospect of unattended operation. Because EBS was the last technical obstacle to legal unattended station operation, and the policy obstacles appear to be fading, the amount of money that the industry can save is simply awesome.

EAS also gives the broadcaster the ultimate control over what emergency information is broadcast, when and in what manner. The issues and options involved here are extensive. Any news director would have an EAS decoder in his budget whether it was required or not. Many news directors will push hard to get better EAS equipment simply so that they can scoop the competition. EAS can also greatly reduce the issues of liability inherent in EBS. EBS always placed the broadcaster in a position of making decisions under pressure as to whether to rebroadcast an EBS message, or even originate one. Further, EBS produced thousands upon thousands of dollars in fines for simple operator logging errors or omissions. A properly installed EAS decoder makes fines very unlikely.

Don't forget that the reduced testing in EAS saves air-time and audience tune-out. Simply stated, EAS can make us better community broadcasters and either save or make us significant amounts of money, if we take advantage of it.

In the space of an article, it is impossible to go into any detail about the remaining features of EAS. With that in mind, I'll ask you to tune in to the second half next time, where I'll introduce them.

□□□

Fred Baumgartner is engineering manager at KDVR-TV Denver, Colorado. He designed and built the first prototype EAS units for the Colorado Broadcaster's Association in 1989 and consulted with TFT in the design of the company's EAS/EIS decoders.

Time to Face Facts

Congress granted public broadcasters a reprieve from a budget crisis by setting the stage for federal funding, albeit reduced, in fiscal 1996 and 1997. But this only provides time for them to breathe a sigh of relief.

The forces behind public broadcasting know what lies ahead. Like it or not, traditional government funding through the Corporation for Public Broadcasting (CPB) is a prime target for House Speaker Newt Gingrich. Public broadcasters have to find alternative sources of revenue.

America's Public Television Stations (APTS), NPR, Public Broadcasting Service (PBS) and Public Radio International (PRI) took the offensive by proposing a "trust fund" similar to that established for the Red Cross and Little League Baseball. Flawed as it may be, the proposition is at least a start.

Today's radio market is competitive from a ratings and revenue standpoint. On the programming side, there is something for every taste, whether it is the contemporary sounds of hip hop on commercial stations or in-depth reporting on public broadcasting that probes the frightening growth of citizen militias.

Just as commercial radio comes up with new and creative ways to fund itself, so too must public radio. Quality programming has always been a hallmark of public radio. Perhaps producing and selling programming to commercial broadcasters and overseas is another way to go. A commercial radio version of "All Things Considered" is a ratings boon that many stations might be willing to pay a premium to air.

Before noncommercial broadcasters reach for the smelling salts, it is time to face the facts. This Congress is allowing for two more years of government funding. Noncommercial broadcasting must be preserved—its services are to valuable to miss. If Congress will not fund it, they should give public broadcasting the ability to fund itself as aggressively as commercial radio, even if this means public broadcasting operates just like commercial radio.

—RW

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World Radio History

In Oklahoma with BBC

▶ continued from page 1

similar set-up on a land line Switched 56 or ISDN at your studio, you can be on the air in broadcast quality from nearly anywhere.

Within an hour, I had booked an A-terminal with COMSAT, a company located about an hour outside of Washington and

Ted Tait (engineer) on roof of van with Claire Bolderson (BBC World Service) in parking lot at Oklahoma bomb site.

told them I would pick it up. I loaded my car with codec, mixers, cables and other gear, made a quick run across the Potomac to Arlington, Va., where I live for some clothes, and started to COMSAT on the other side the city for the sat-phone.

I was out the doors of COMSAT before 6 p.m., but thanks to the diabolic trappings of beltway traffic, there was no way I was going to make it to Baltimore Washington International airport for the last available flight from the metro area to Oklahoma that night. I was re-booked for the 7 a.m. Thursday flight from nearby Washington National Airport.

Less than 12 hours later, I stood at the ticket desk for the flight and began to understand what I was in for after seeing the deluge of news reports on TV.

After checking the sat-phone as luggage and having it marked "heavy"—the unit weighs 85 pounds—and "fragile," I winced as the attendant dropped it on the conveyer.

At this point, I was joined by Claire Bolderson, one of our bureau World Service correspondents, also being sent to cover the story for the some 120 million BBC listeners around the world.

On site

By early afternoon, we were on site, a parking lot swarming with TV satellite trucks and other media just a couple hundred yards from the ravaged Alfred P. Murrah Federal Building.

The local authorities had closed streets for blocks around the building. It was amazing to see the damage the blast caused, even blocks away.

Entire buildings were destroyed, not just the federal building. It reminded me of damage I had seen from natural disasters, but this was not natural.

Already on site were two radio producers, and several correspondents. They were all busy gathering material for their reports. My job was to get it back to London in broadcast quality.

To get a clear shot over the other vehicles, I put the sat-phone on the roof of the minivan we rented. With a little experience, if things go well, you can be on air with one of these units in less than 15 minutes.

Not this time.

For some reason, calls would not go through. Discussion with COMSAT via cell-phone led to the conclusion that this phone had a bad circuit card and could not be made to work. They would have to send another one via Federal Express. I thought of that baggage handler haplessly tossing equipment onto the belt. For now, our correspondents would have to file material via cell-phone and on the back of TV feeds when possible.

After checking the sat-phone as luggage, I winced as the attendant dropped it on the conveyer.

The new sat-phone arrived on schedule Friday morning and was set up in place of the defunct unit. This time, calls went through, but all London could hear was static. Another call to the help line revealed that the unit was improperly configured for 64 kb, which will not work through COMSAT earth station in Southbury, Conn.

Problem solved

Fortunately, a simple change on a configuration menu solved the problem and we were on the air from our minivan, using power borrowed from a nearby TV satellite truck generator. The sat-phone draws about 230 W when transmitting. The simplex mode of operation for these sat-phones is not quite what you might think of as simplex.

Although the high-speed data only travels in one direction, there is a phone quality return audio circuit associated with the line perfect for use as an IFB (interruptible feedback) from the studio. By diverting this audio to a headphone amp, our people are able to do live reports and answer questions.

Meanwhile, the local phone company in Oklahoma, Southwestern Bell, was on site to help provide services for all of the press in the makeshift media pavilion. In addition to asking for some dial tone lines, we asked if the phone company could provide either Switched 56 or ISDN quickly. A call back to the Washington office set the wheels in motion for a CSU (circuit switching unit) to be sent overnight to us, but we had no spare codec.

Half a dozen phone calls later, I was in touch with Silverlake Audio, a company on Long Island, N.Y., that was recommended to me a while back as a place to rent codecs and other gear. It was after 5:30 p.m. Eastern time, so my hopes were fading. Silverlake said it would have to get back to me and by 6:30 p.m., ET, I was running out of options. Thankfully, within minutes Silverlake called back to say the codec was on its way Federal Express. The company rep said he hadn't called before because he was racing to make the Fedex deadline—and barely made it.

At last everything was in line. I had a working sat-phone, and everything for a land line SW-56 on the way. Having a second setup was going to be important because our producer informed me that President Clinton was going to be at the state fairgrounds on Sunday for the memorial service. BBC wanted to run his comments live, while still getting reports from the bomb site.

BBC offers many different services, some wanting live coverage, others needing bulletins and updates. Radio 5, a network dedicated to broadcasting live news and sports events, has 5 million listeners each week. They wanted Clinton's comments live. The sat-phone would have to go to the fairgrounds.

Warm and dry

Friday night it hailed, and all day Saturday it rained with temperatures in the 50s. We spent most of the day trying to keep ourselves warm and dry. When I hurriedly packed my clothes I never imagined that Washington's temperatures in the upper 70's would take such a dip as I headed southwest to Oklahoma.

I also worried about keeping the sat-phone dry. The winds tended to move the plastic tarp I bought. Saturday night, the White House Press Office held a meeting about what would be available to the media for Sunday's memorial service.

The prospects did not look good. We could not take a vehicle from which to broadcast close enough to the audio feeds. What were we going to broadcast from, and how could I keep the sat-phone dry without blocking its line of sight to the sky?

A trip to the local Wal-Mart at 11 p.m. brought solutions. A nylon tent with fiberglass support rods was just what the doctor ordered.

Sunday, the tent was up in about 15 minutes and the sat-phone another 15 minutes after that. Our mobile studio was on the air. We ran an audio line to the company providing the sound and got the entire service. Our correspondent spoke live with London and anchored until President Clinton took the podium. Meanwhile, our minivan crew was filing update reports for other services from the bomb site.

The sat-phone had served its purpose. It got us on the air from multiple locations quickly in broadcast quality. For the rest of the story, we could now use the land-line that was installed, which also would save money in the long run, as the sat-phone calls are very expensive. HSD calls are more than $12 a minute during peak periods.

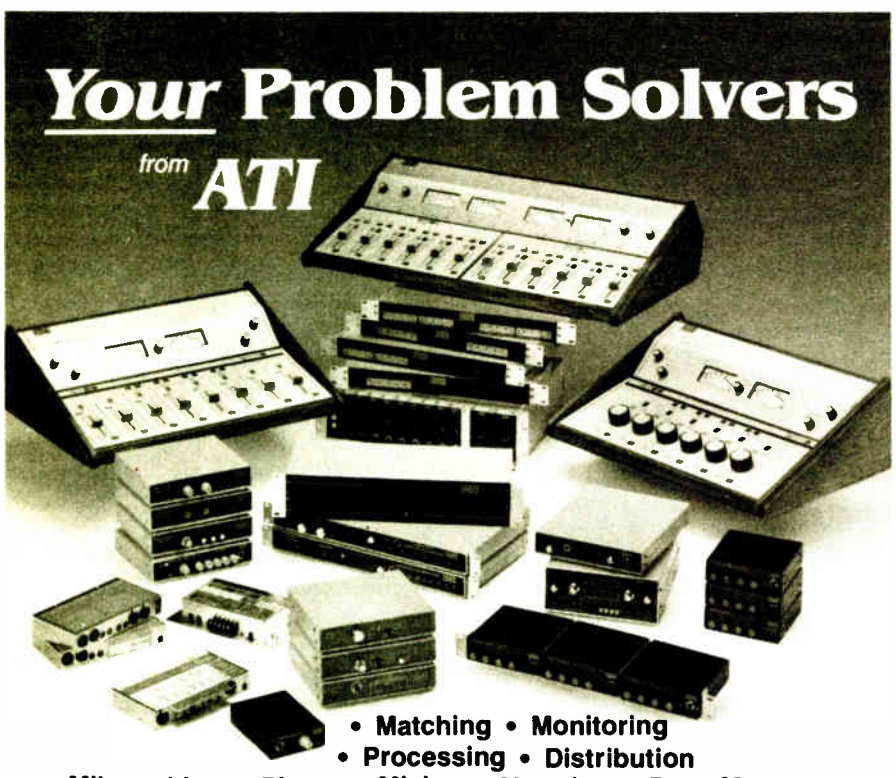
But when you need to be on the air quickly from places where you're unsure of what, if any, services may be available, they get you on the air. We've used them in cities around the U.S. for fast moving stories and places like Haiti where you cannot count on local services—phone or electric.

With the largest technical hurdles overcome, and a more stable land line installed in the van, my work was finished. The rest of the story would be covered from the minivan in the parking lot and our bureaus in Washington and New York.

I gathered the two sat-phones and excess gear and headed back to Washington, ready to resume my vacation.

□□□

Ted Tait is chief engineer of the BBC Washington Bureau. He can be reached at 202-223-2050.



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OET Chief Steers Course for Change

▶ continued from page 1

see it as more of an additional service that is complementary. I think, if anything, it will probably compete more with cassette tape and compact disc than with over-the-air broadcast. Terrestrial broadcasters will always have the localism advantage."

Localism is a particular strength of AM service and AM is perhaps the medium most vulnerable to new technologies. Smith said AM broadcasters should focus on their strengths.

"AM broadcasters are faced with some challenges, of course, but more in terms of quality," he said. "FM sounds better than AM. AM did not get stereo, in part due to decisions made in the commission. And there are propagation conditions that work both for and against the AM broadcasters now.

"What AM broadcasters have to do, is to look at the things that they have that work for them. One of the things is the large geographical area of service. I'm not saying that they (AM broadcasters) do not have their work cut out for them. I do not see them fading away. I think some of them may not make it, but most of them will."

Setting standards

Smith is a proponent of setting standards, but with some mixed feels.

"There is a little bit of downside," he said.

"Every time you set a standard, if it is (a government rule and regulation), sometimes it is difficult to change, and it may be difficult to allow flexibility."

Smith also suggested that it may not make much difference if one standard is selected over another. "The important thing is to pick one so that everybody can then go ahead, and for economy of scale and other reasons, produce a unit that will work in Washington and Los Angeles—wherever you might go," he said.

In the trenches

Smith has worked in the trenches long enough to speak with the voice of knowledge. He paid his dues at the agency and earned his post through a long and steady climb to the top.

Right out of college, Smith began his FCC career as a field engineer in the Los Angeles office. He also has been engineer in charge of the Philadelphia field office, chief of the Investigations Branch in Washington, and, before his current position, chief of the Field Operations Bureau.

The OET, under Smith's direction, is composed of four divisions that perform a variety of functions.

The Policy and Rules Division is what Smith called "the expert drafter of rules and regulations that will be recommended by the OET to the commission for adoption." The Allocations and Standards Division works on standards.

We want to make sure technology is in fact made available—that we, the FCC, are not in the way of its development.

The third OET division deals with equipment authorization. "Of all the work the commission does, perhaps none is more important than preventing interference among this tremendous multitude of RF generating devices—not just radio transmitters, which are fairly simple to control," Smith said.

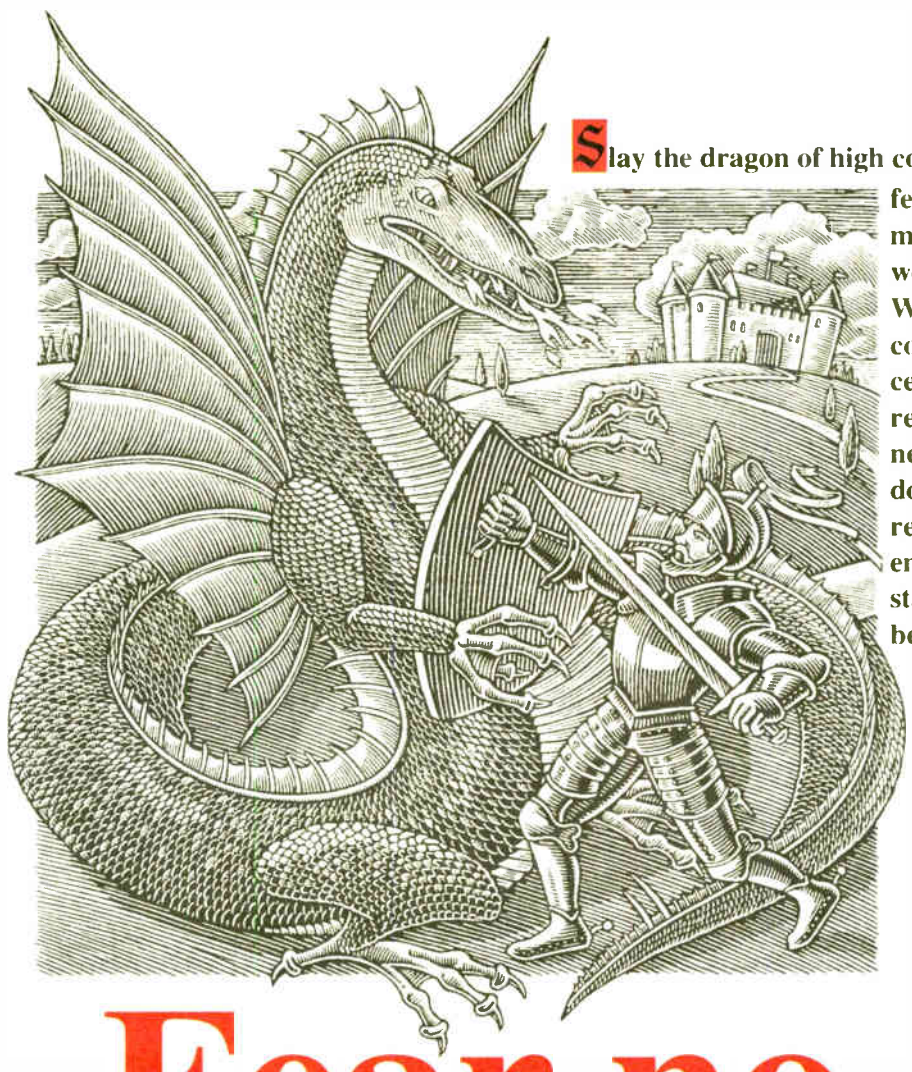
The New Technology Development Division "is our effort to push ahead the process of getting technology to the marketplace as soon as possible," he added.

Smith looks at the OET as quite an exciting place.

"I think some people think, perhaps, or have an image that the engineering side of the house is there, it is necessary, but it is not where the excitement is," he said.

"Actually, it is a pretty darn exciting place. I'm just having a great time in my second career at the FCC. I'm looking forward to being here for awhile."

See page 39 for more news from Radio World



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World Radio History

Keep Your AM Array in Top Condition

by Thomas R. McGinley

GREENBELT, Md. Digital audio broadcasting on the AM band (AM DAB) has posed a whole new set of questions and concerns to AM broadcast engineers. Certainly the recent mobile demonstration of the USA Digital Radio AM DAB system at NAB '95 in Las Vegas was almost spectacular.

Listening to 15 kHz stereo come out of an AM transmission chain and receiver was downright breathtaking. The USADR AM DAB signal uses almost the entire 40 kHz AM channel and stays within the NRSC mask. Most of the information beyond ±9 kHz is digital phase modulation. We know that bandwidth performance and phase response across the channel will be important in transmitting quality AM DAB, no matter what the system.

Many of us discovered that C-QUAM and Kahn AM stereo presented special challenges for some AM arrays when first installed back in the early '80s. AM DAB will undoubtedly be even more demanding.

The biggest favor you can do for your transmitter/antenna performance is present a symmetrical load to the modulated PA stage at the sidebands. For AM stereo, we only worried about ±10 kHz from carrier, but for DAB we really need to be concerned about ±20 kHz. Phase rotation via line stretching is the oldest and still the simplest method to allow the modulated PA to "look" at balanced sideband loads so that modulation may be passed efficiently to the antenna. Use the venerable "10 kHz tone test method" to first evaluate your modulated sideband response and then to readjust the phase delay across the antenna tower base tee network or common point matching tee network in the phasor for a directional array. This simple but tell-tale task was first described by my friend Peter Burk of Burk Technologies back in a 1977 trade press article.

During your off-the-air maintenance period (hopefully you still have one), modulate the transmitter in a low power mode to exactly 50 percent with a 10 kHz sine wave. With a field intensity meter, go out in the major lobe about a half mile. Tune in your carrier frequency for a maximum reading and set the field strength to full scale 100 percent with the range and gain controls. Then tune in each sideband at ±10 kHz and carefully note each recovered field strength reading. Don't change the gain control or worry about calibration. A perfect bandpass response would produce a relative field of 25 percent at each 10 kHz point. If your system passes 25 ±1.0 at each sideband, any additional improvement will be insignificant. Try modulating with 15 kHz if your transmitter will do it and note the results. Twenty-kHz tests will probably not be possible, unless you defeat rolloff circuits in the audio and modulator sections. You probably shouldn't attempt this with high level plate modulated transmitters! Obviously these tests go much easier with two engineers equipped with handheld radios.

If your results show significant departure from the 25 percent ideal values, your antenna system is likely the culprit and is distorting the sideband response, which means distorted audio and loss of high frequency response in receivers. The next step is to employ the line stretching maneuver at the ATU or CP matching network. What you are doing here is repositioning the impedance window through which the modulated PA stage looks. All reactive elements downstream from the PA will shift the phase or the position of the window. The goal is to position the carrier in the middle of the window so that both the upper and lower sidebands will receive equal amounts of modulated power.

Phase rotation involves changing the phase shift across the network while maintaining the required impedance match. It is easily accomplished with a full range tee network with an OIB in-line impedance bridge monitoring the input. Change the coil tap on the output arm of the network no more than one turn at a time, and then reset the required resistance match (usually 50 ohms) with the shunt coil tap and the reactance match (usually 0 ohms) with the input or line side coil tap. Each time you move the phase and reset the network for proper match, do the 10 kHz tone test and have the field engineer relay the results. If the sideband values are moving towards 25 percent, you are going in the right direction. If not, move the output arm network tap the other way, reset and retest. The goal is to pull both sideband response components as close to 25 percent as possible. If you run out of range with the network installed, you will have to reconfigure it for less or more delay and perhaps change it from a lagging design to a leading design. Consult the NAB Engineering Handbook or other appropriate text for assistance.

With simple nondirectional antennas at least 80 degrees tall and higher, you may find this procedure will have little impact on the 10 kHz tone performance. You may need to do 15 kHz or even 20 kHz tests to see significant changes, unless the matching network was not set up properly to begin with or it provided excessive phase delay beyond about 120 degrees. For wide-spaced and most parallelogram directional arrays, the results should still be reasonable, but you should find some improvement is available. The real "stinker" arrays out there which will probably have lots of room for improvement include the close-spaced designs (elements less than 90 degrees apart) and the in-line "end fire" designs

continued on page 13 ▶

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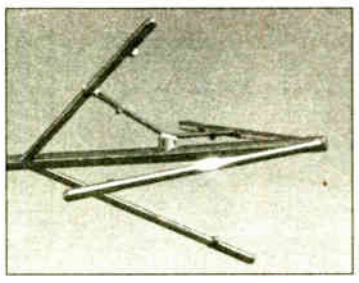

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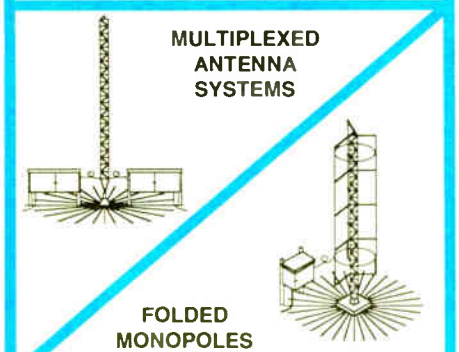

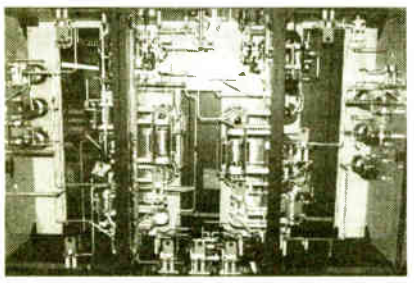

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Integration Key Word in Telco Technology

WASHINGTON If this year's NAB convention was abuzz with digital, it was in large part due to the wealth of new boxes available to help move audio digitally from point A to point B. The new designs focus on integration and function.

Whether as a stand-alone product, or part of a larger system, the transportation of audio over telephone lines has been making a splash lately. From announcements by the regional Bell operating companies (RBOCS) rolling out ISDN across the United States to smaller, more utile products being developed and introduced at broadcast trades shows, the manufacturers and users of this equipment are making headlines.

Telos Zephyr

Easy to use

Plain Old Telephone System (POTS) boxes are still a broadcaster's best friend. A particularly neat and cost effective item for solving studio telephone problems is available from Gentner Communications. Appealing to both the broadcast studio and the teleconferencing market, the Gentner digital TeleHybrid series, including the TH100 and TH120, offers a literally one-button, nothing to adjust, no more product to purchase for connecting audio equipment to phone lines.

The TeleHybrid can be used with almost any business telephone system and its features including conferencing (if your system has it). With the TH series, you connect the unit in series with the handset of your phone, connect audio in/out via the XLR type plugs, place the handset on the sensor pad, and *voilá*. There are some adjustments upon initial installation.

Broadcasters on the road can now turn a number of new products optimized for getting audio back to a studio from a field reporter's laptop. From Seattle's Audion Laboratories comes the VoxPro/FX, a PowerBook version of its on-air studio telephone recorder. This provides a laptop version of the company's workstation and is optimized for field news gathering.

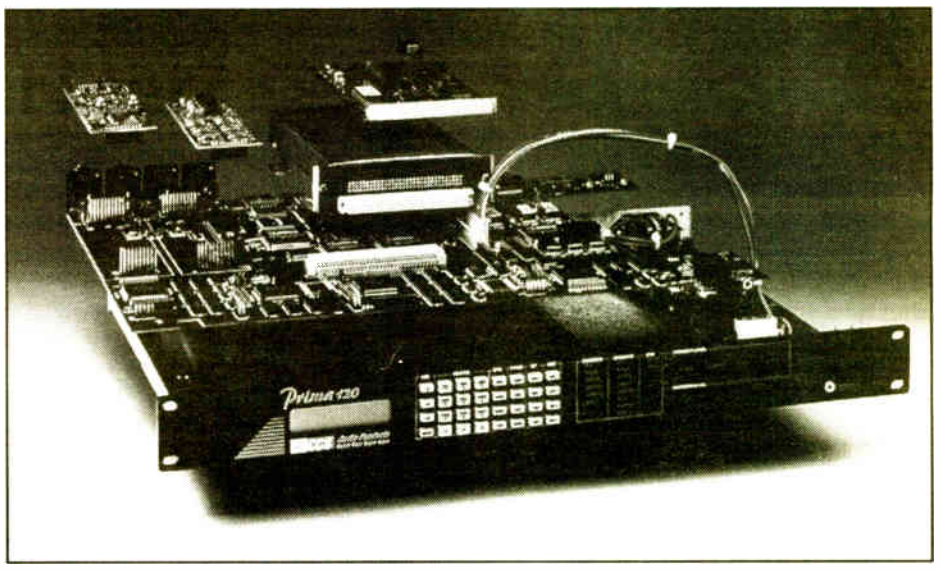
Scott Studios now offers a telephone recorder software package for its line of workstations.

CCS Audio Products is offering a POTS product that uses MUSICAM HQ, a proprietary version of ISO/MPEG Layer II. The CCS FieldFone is the world's first digital audio codec for POTS. This unit allows bi-directional 7.5k audio via a regular telephone line. The FieldFone incorporates all the mixing, cueing and other features necessary for remote production.

There are several specialty products that can serve your facility—whether you use POTS or ISDN. Comrex Corp. recently introduced the Codec Buddy, a complete four-input mixer, analog or ISDN IFB mixing and headphone DA system. It is designed to support the "codec" market, the unit's features make it useful in any remote application.

With some technical planning ahead, you could take the Codec Buddy and your 64k ISDN gear anywhere in the world using the Global Phone 3000 from Glocom of Bethesda, Md. The Global Phone is a totable satellite phone that provides digital connectivity via the INMARSAT-B satellite system.

Henry Engineering now offers the Telestor line of products. Doing just what the name says, the Telestor will answer a ringing line and record the incoming audio for later retrieval. Featuring one to five minutes of storage, the unit can replace your coupler, tone decoder, cart machine and their requisite space.



CCS Prima 120

Phone interfacing

J-K AUDIO offers several telephone interface products including its new Remote Mix C+. The Remote Mix includes mic, line, IFB and dialing functions in a small, battery-powered package for use with POTS or Cellular RJ-11 adaptors.

AEV is now selling the UMR 6200 portable telephone reporter unit here in the United States. Featuring six mic/line inputs with EQ and phantom supply, two output busses, telephone hybrid, tone oscillator, recording and IFB/ monitoring systems, this is a versatile 25 pound portable studio with internal battery or AC supply.

From the United Kingdom, Systembase Limited is now selling the RG70 two-to-four wire converter that allows for interfacing 2 x 3.5 kHz IFB, telephone or intercom systems over ISDN lines via a single B-channel and the data port.

By far ISDN products number the most new products for telephone use.

RE America, Telos, APT and others unveiled new products this year for use on multiple BRI-circuits or the next level, ISDN-PRI, Primary Rate Interface. The PRI service level brings multiple ISDN (11-24) circuits to your location over a single T1 type circuit. When used with the appropriate terminal adaptor (T-A) and call management system, multiple ISDN lines and ISDN-PRI allow rapid connectivity and control over multiple audio feeds and destinations at standard or greater bandwidth than possible with a single BRI-service channel.

Using multiple ISDN lines requires an inverse-multiplexer to assign portions of the data to each ISDN line. The inverse mux (IMUX) is typically an integral part of either the terminal adaptor or the codec. Telos Systems recently upgraded its popular Zephyr ISDN transceiver by adding ISO/MPEG Layer II and an internal NT-1. The Zephyr already supports G.722 and Layer III in mono and stereo formats. Telos plans to begin shipping these upgrades later this year. This will be the first fully-integrated stereo ISDN product with bi-directional codecs, T-A and NT-1 all built in.

Comrex Corp. offers the DXR.1 (rack mount) and DXP.1 (portable) upgrade product of its popular G.722 coding series of codecs. The X.1 upgrade provides 15 kHz mono audio via both B-channels of a single ISDN or Switched 56 line. The units must be used with a T-A that provides bonding and an IMUX. Such units include the AdTran ISU-128 and similar products from UDS/Motorola and INC.

Music applications

For music applications, Comrex offers the MusicLine DX200 series of stereo codecs featuring ISO/MPEG Layer II, an internal IMUX and three sample rates for $3,000 per unit.

CCS's new line of CDQ PRIMA codecs offer a variety of choices. Unique to these five units are an extensive internal array of diagnostic, automation and logic interfacing options including spectrum analyzers, silence sensing, triggerable routines, multi-

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World Radio History

Keep Up with Your Array

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with the major lobe directed in-line with the towers and deep forward nulls off the side. Such arrays will typically have a higher RSS/RMS ratio greater than about 1.5. Find those numbers on your license and divide to compute the ratio, which is a bellwether indicator of array design efficiency and bandwidth performance capabilities.

Many of the older three-, four- and five-tower in-lines have RSS/RMS ratios above 2.5, which present a much more difficult challenge.

It is probable that with many such arrays, you will not be able to get the sidebands to move together or come anywhere near 25 percent as you are performing the 10 kHz tone test. To really fix this problem, a complete redesign of the power divider, and the branching and phasing scheme of the system may be necessary. This is best performed by a competent consultant who specializes in AM antenna systems (there are only a few really good ones left). They use a computer-assisted technique known as nodal analysis to look at the bandwidth performance of every network or node along the path from phasor power divider to every tower base in the system. Phase delays and optimized networks, including equalizers are designed to yield the best overall system bandwidth response.

If you do not have the budget to hire such expertise to redesign and rebuild your entire system, there is another approach which will likely yield significant improvements but it will take some time and effort on your part as chief engineer. If you understand RF network design, are comfortable working with an OIB in-line bridge, have a decent stock of spare parts on hand, and have a helper, you could save a ton of money and wind up a hero to the general manager. I call this "Do-it-yourself-broadbanding" and assumes that you are going to leave the operating parameters as licensed. To go into detail regarding this approach is beyond the scope of this article, however, I will highlight the basics.

The first step is to analyze the phasing system schematic. Identify the high power tower. Add up all the phase shifts in the feed to this tower from the output of the common point network to the tower base, including the power divider and phase shifter, if any, plus the transmission line delay and ATU network delay. If none of this information is available on the schematic or its accuracy is questionable, you should determine it by actual measurements. Measure the actual power distribution to each tower using an OIB and Ohms law. Network phase shifts will have to be determined by reactance arm measurments with the OIB, or an accurate LCR multimeter. Transmission lines may have to be measured for actual phase delay, using an accurate RF signal generator and oscilloscope.

We want to employ what is known as "quadrature phasing," a technique that typically provides an optimized phasing scheme for best bandwidth performance of the array. The total added phase shifts here should be 90 degrees or an odd multiple thereof (+/-90,-270, -450, etc.). The rest of the branch phase shifts to the other towers will then have to be designed around this quadrature phasing of the high power tower to make the array work with original operating parameters. Also be sure your design uses a modern power divider. Unequal resistive tee network dividers to higher power towers and basic Ohms law shunt dividers for low power towers are favored by most consultants. If possible, the highest power tower should have no phasor network. The old push-pull tank dividers with the grounded center-tap are real bandwidth killers and should be updated.

If you are very lucky your existing design incorporates at least something within 30 degrees of quadrature phasing to the high power tower. If not, you should probably consider redesigning all the branch phase networks and retuning the entire array. The rest of the job is really quite straight-forward. Match each ATU to 50 + j0 with the OIB, starting with the high power tower first, and working your way down to the lowest power tower. Do this task with a knowledgeable helper at the base as you work the phasor. Maintain pattern parameters each time a network tap is moved in the matching process. Don't worry if low power towers, especially "ambivalent" tower bases near zero ohms are not well matched. Just be sure they do not significantly change the common point match when momentarily disconnected from the phasor power divider.

The other necessity in such an effort is to use networks with phase delays between about 45 and 90 degrees and to pick network component values so that each reactance arm of each network is composed of nearly "pure" reactance, i.e. very little "trim" coil is active when used in series with a capacitor to tune the arm.

If you really want to go further in achieveing as flat a bandpass as possible, you will likely have to include the use of equalizer networks or "inverse-slope" reactance arm treatments to the high current networks in the array.

After you have accomplished all of this, rerun the 10 kHz tone test and phase rotate the common point to reset the 10 kHz sideband values each closer to 25 percent. The improvements may very likely be dramatic with the more poorly designed and misadjusted arrays. We pulled a five-tower in-line out of the mud a few years ago using precisely the foregoing techniques. Before doing anything, the ±10 kHz tone test values measured nine and 14. When we finished, they measured 22 and 25. The program director and general manager were ecstatic. AM DAB will no doubt like it better as well.

Circle (204) On Reader Service Card

World Radio History

X-Ray Your Signal from the Sky

by Bob Rusk

SEASIDE, Ore. It is an engineer's worst nightmare: the antenna that has slowly been degrading over the years and lost an element during a severe storm last winter has just been replaced. You are sure the station's signal is finally going to be back to full strength. You power up and anticipate how much better the coverage will be, then hop into the truck and drive around town monitoring the station—and quickly hear that the signal is weaker than ever.

As frustrating as that would be, take comfort in knowing that this scenario is not uncommon, and there is an effective remedy—FM antenna pattern measurement from the air.

Akin to an X-ray

Aerial measurement is akin to taking an X-ray of a station's signal, according to Stephen McNamara, president of Little Rock, Ark.-based Stephens Communications.

"That's exactly what it is," says McNamara. "It's making the invisible visible. If all of a sudden you could see the RF coming off the antenna, that's what you would see."

McNamara has been flying patterns since 1983, combining the fields of engineering, aviation and computer imaging. Once imaged, a station's signal can be displayed on a computer screen and printed on graph paper.

McNamara adds that it is not the theoretical signal which is measured, but the actual signal that is transmitted from the antenna site, including both horizontal and vertical patterns.

"You're able to look at the energy actually coming off the antenna and then can come up with the coverage area," explains McNamara. "That's why you have to do it in an airplane (although others in this field use a helicopter), because you get above all the ground clutter. You get away from the fences and moving vehicles" that interfere with the signal.

Rating performance

Tom Becker (who favors using a helicopter), owner of Air Systems Technologies in Dallas, who has been doing aerial measurements since 1984, adds, "There is no other way to truly measure the performance of the antenna system. Doing it on the ground gives you very misleading data.

"An antenna might be mounted on the leg of a 2,000-foot high tower, just below the top. The antenna system might be 100 feet long. The center of it—the 50-foot point—is the center of radiation, the altitude at which the pattern of the antenna is usually measured."

In instances where a station puts up a new antenna yet receives inferior coverage to the old one, mounting is usually the problem, according to Becker.

"We can measure a pattern and then suggest to move a lobe that might not be right on," he says. "While in the air, we can continually monitor the antenna while a crew is on the tower literally swinging the antenna in real time as we're measuring it.

"As we orbit the tower, maybe a quarter-mile from the stick, the station's crew can make a temporary move, tighten the bolts, and we'll make a couple more loops around and determine just how it's working at that position. We'll do perhaps six or eight discrete positions of the antenna," continues Becker, "collecting rough data for each position. From that we can select the position of the antenna that works best."

Good for tweaking

In cases where the antenna has not been damaged yet coverage isn't what it should be, simply moving its position on the tower can result in increased coverage.

Says McNamara, "I've had clients say, 'I'm a 50,000-watt station. There's a bunch of 50,000 watters in town. Everybody's got a great signal but me. I don't understand why.'"

"We'll go out and discover the station has a big hole going over the town," McNamara continues. "Anytime you put a piece of steel up to hold your antenna, it's going to distort the pattern. Usually it's just a matter of moving the antenna, and the coverage is perfect."

McNamara stresses that even if a station's signal is fine, aerial measurement can still prove beneficial. As an example, he cites one country station that used his service.

"The station said, 'Our signal is fine. The coverage is great. We just want to know where the signal is going,'" recalls McNamara. "But more importantly, if the antenna were to get hit by lightning or the transmission lines burnt up, the station would know what kind of signal they used to have."

While aerial measurement is the ideal way to track an FM station's signal, it is not practical measuring an AM signal from the air, because AM is transmitted on ground wave.

Most of the stations that use aerial measurement are in major markets, where an optimum signal could translate into better ratings.

"Those stations are looking for an edge," says Becker. "They have the best hardware, the latest state of the art digital equipment, and yet might consistently be number two or three. Investigating the antenna and optimizing it might be the thing that puts them over the top."

Lightning Strikes Can Wreak Havoc on Radio

by W.C. Alexander

DALLAS It seems that every few years, the subject of lightning protection comes up, particularly this time of year. The topic is timely and relevant, and in this day and age of solid state transmitters and digital everything else (including transmitters), bolts from the blue are more troublesome than ever.

A lot of stations have spent fortunes to keep lightning out of transmitter equipment. A lot of stations have spent even more cleaning up after lightning has blown their equipment to pieces. Good lightning protection is a lot like crime prevention. It is much better to keep the burglar out in the first place than to go through the hassle of the insurance claim after he or she has cleaned you out.

Lightning strikes enter the transmitter plant via the antenna, tower structure, power lines, phone lines and through inductive coupling to inter-device wiring. How often strikes occur depends upon several things, including local topography, tower height, proximity and height of other towers and structures and incoming power line routing.

RF power amplifier circuits are particularly vulnerable because they are more-or-less directly coupled to the outside world via the transmission line(s) and antenna(s). Rectifiers and other power supply components are likewise vulnerable because they are tied to the incoming AC power service.

Before we get into specifics, let's consider the types and incidence of lightning strikes.

Weather lesson

As a rule, most thunderstorms that produce cloud-to-ground lightning are localized and short in duration, caused by convection (rising air due to localized heating).

The fortunately less-common air-mass type storms, on the other hand, are caused by frontal boundaries of warm, moist air meeting cold air. These storms can cover a large area and persist for some time.

There are maps published by the National Weather Service showing the incidence of electrical storms for the various parts of the U.S. The region from Florida and across the southern states is the hottest area. Central Florida typically has 37 strikes per square mile annually.

Consider that a tower structure of h feet in height shields an area of about $9\pi h^2$ square feet, a radius of three times the tower height. That means that a 500-foot tower will shield an area of more than 1/4 square mile. In an area where there are 100 days with thunderstorms each year, a 500-foot tower may be struck nine times a year if air mass type storms are predominant, or only once in a year if convective storms are more common.

The main stroke of a lightning strike consists of a quick rise and almost exponential decay of current that is from a high impedance source made up of a long length of ionized air. It has been presumed that the inductance of the air path is responsible for the rate of rise of the current, and the resistance for the peak value and rate of decay.

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Telco Technology

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"virtual control lines" for remote operation of one unit from another.

Intraplex joined the codec fray with its recent unveiling of the ISO/MPEG Layer II codec module for its T-1 mainframe and an ISDN offering, the Series 4400 Codec. Incorporating Layer II and G.722 codecs with T-A, bonding and single stroke call setup, the Series 4400 is small, lightweight and offers 7.5k-20k bi-directional audio.

RE America has upgraded its 600 series codecs, which adds G.722 coding.

Nagra/Kudelski is offering the Nagra ARES-C, a portable stereo/mono newsgathering system, similar in size and construction to other Nagra products. The ARES includes an ISDN T-A, POTS jack, RS-422 control, the usual Nagra assortment of audio mixing and control features, analog and AES/EBU I/O, an internal editor utilizing edit decision lists (EDL) and PCMCIA flash memory cards for data storage.

Among the first to fully integrate ISDN-BRI-, PRI- and PC-based, user configurable workstations for audio and text delivery is Digital Courier International. Unlike some products that provide primarily unidirectional delivery the DCI system allows stations, production houses and advertisers to exchange materials in MPEG/II compressed form on a per-call basis via the provided internal codec and ISDN T-A.

The advertiser or production house uploads, via ISDN-BRI, its product to the DCI service bureau. DCI then redistributes the material via ISDN-PRI to similar BRI-equipped terminals at each station. A station may edit the audio and copy, then resend the material to sister or duopoly stations. The audio remains in digital form throughout the process.

Telos Systems has added the ZephyrNet to its line of products. Zephyrnet is a PC-based audio switching and call management system. Based upon the Zephyr transceiver, the ZephyrNet may receive remote or local audio/data for redistribution to other Zephyr-equipped sites via either ISDN-BRI or SW-56.

Dolby Laboratories is making available its DOLBY FAX product. Using Dolby's AC-2 coding (existing DP502/501 product line) a PC or Palmtop controller and its own T-A, the DolbyFax can transmit non real-time audio, video, CPU data or Group IV faxes over two ISDN-2 lines.

APT is offering WORLDNET, which uses the new MCE/MCD 800 series codec to transmit up to eight channels of audio over ISDN, SW-56, fractional (E-1) or full (T-1) digital circuits using apt-X coding. Additional products allow for remote machine control via the data ISDN auxiliary channel (Model RMC240); a lightweight, portable, 'reporter terminal' incorporating an internal T-A with IMUX for transmission of a reporter's audio and computer data (DRT-128).

World Radio History

CCS Introduces the CDQ*Prima*™ Series

CDQ*Prima* Model 120 shown

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World Radio History

Protect from Lightning

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An average lightning strike pulse has a peak amplitude of 20,000 amps lasting 40 microseconds. This is based upon the median value of gathered empirical data. The rise time of a typical strike pulse is about 5 microseconds to peak amplitude.

Protection points

A lightning strike is a discharge from a cloud into the semi-infinite reservoir of electrons which is commonly known as "ground." "True ground" is an elusive connection at the earth's surface. Practical ground connections range from a few ohms to several hundred ohms to "true ground."

Assume that a typical strike occurs to a grounded tower. If the resistance between the tower's ground connection is 50 ohms and the stroke current pulse is 20,000 amps, the potential across the ground connection would be one million peak volts. If there are remote grounds also connected to the tower (such as transmission lines connected to grounded transmitters), the discharge current will be proportionately distributed among all the parallel paths to ground.

Obviously, then, the first and most important principle is to provide the very best, lowest impedance local ground at the tower. A ring of driven ground rods may be the best way to achieve such a local ground. Do not assume that a buried radial or mat ground system provides a good earth ground. Such a system may have a high capacitance to "true ground" and be ineffective as a local ground, even if it works well as an RF ground.

No matter how good the local ground is, some portion of the discharge current will flow through the transmission line outer conductor to the remote ground(s). This will induce a high voltage between the inner and outer conductors of the coaxial cable at the transmitter end of the line. This must be met with spark gap or gas discharge devices, but the first concern is the path the current actually takes *en route* to remote grounds.

The second principle, then, is to prevent the current from flowing through the transmitter equipment itself. Have a clear knowledge and understanding of all the possible remote ground paths. These will consist of the local ground, the incoming AC supply, audio cables and remote control cables. A careful arrangement of the ground connections within the transmitter plant is essential.

Give each path between the tower and ground a solid connection directly to a single point, referred to as the "station reference ground point." This, in turn, is connected via short and heavy conductors to the ground post of surge protectors connected to all incoming AC supply, audio, control and metering cables. Between the connection point of each path to the reference ground point and the individual pieces of equipment, some inductance should be provided to resist the flow of the fast rise-time energy along that path. This forms essentially a low-pass filter between the tower and the equipment.

Installation

Surge protectors

Each conductor of all cables entering or leaving the transmitter building should be bypassed to the station reference ground point with the proper type of surge arrestor. Surge protectors on the AC line should be capable of shunting up to 20,000 amps for 100 microseconds without deterioration. Protectors across remote cabling and phone lines can carry lower ratings due to smaller cable sizes and their corresponding higher impedances. Varistor type elements or back-to-back zener diodes can often be used for such bypassing.

Ferrite chokes

Ferrite beads, toroids and cylinders threaded over the cables connecting to transmitter equipment effectively raise the impedance of the current path along those conductors to fast rise-time pulses. Even the coaxial transmission line inner and outer conductors should be passed through such cylinders or toroids, unless the coax diameter exceeds two inches, where it is permissible to omit them.

Surge protectors across transmitter terminals

An air gap and a gas tube protector should be provided across the transmitter RF output terminals. The air gap provides a very high current shunt element, while the gas discharge device has a specific breakdown voltage.

ATU spark gap

A supplemental air spark gap should be provided at the ATU output. This gap can be smaller and less rugged than the large ball gap at the tower base. Horn-type gaps are perfectly acceptable here. The gap should be selected so that normal modulated RF voltage will never jump across. In cases where the tower is not DC-grounded by a tuning unit component, a static drain choke should be installed across the supplemental spark gap.

Antenna feed wire

A quick and easy way to reduce lightning current flowing into the ATU is to wind the antenna feed wire into a two- or three-turn coil *en route* to the tower. This will provide a series inductance that resists the fast rise-time lightning energy. The output leg of the ATU network should be adjusted to compensate for the additional series inductance at the station's operating frequency.

Ball gap across base insulator

For base insulated towers, the first line of defense is the ball gap at the tower base. The spacing should be adjusted as with the ATU spark gap, and the balls should be separated horizontally rather than vertically, to keep water drops from reducing the effective spacing.

Tower local ground

A minimum of four ground rods in a ring about the tower base driven below the frost level into the water table is necessary to achieve a good local tower ground as discussed above.

Ounce of prevention

As I already stated, much more has probably been spent over the years fixing lightning-damaged equipment than has been spent on lightning protection. Surge protectors are not cheap—a series/shunt 200-amp 240-volt three-phase AC line protector can cost about $8,000. If you consider that it will be protecting well over $100,000 worth of transmitter equipment, though, this becomes much easier to swallow.

Knock on wood, but we seldom have any lightning-induced damage to any of our fifteen transmitter plants. Most have had no damage in years, and others that used to be prone to damage have taken no further damage since the principles outlined here were implemented.

If lightning is a problem at your transmitter site, consider these principles. It is likely that you can make a big difference without spending a fortune.

□□□

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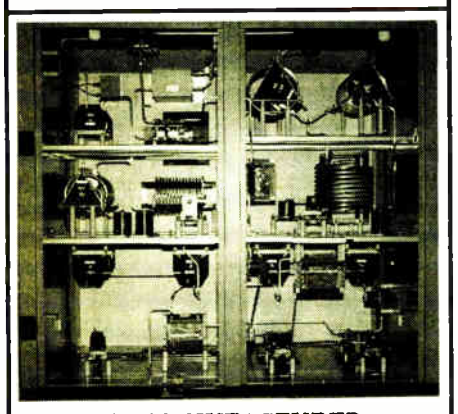

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World Radio History

Shaped Probes Ease RFR Compliance

by John Bisset

SPRINGFIELD, Va. Over the past several years, all types of radio transmitting facilities have moved to co-located transmitting sites. In many cases, this grouping of radio and broadcast transmitting antennas has been the result of zoning ordinances. In other situations, a superior coverage may be obtained from one specific location. Whatever the reason, more services are locating their antennas on the same tower or on a single rooftop.

With the explosive growth of wireless communications—cellular, paging, PCN, and soon wireless cable determining compliance in a multisignal transmitting environment can seem overwhelming to the site manager.

True RMS detection

If measurements are to be made, and an RFR survey conducted, it is important that the survey instrument provide true RMS detection, or the readings will be over stated. This becomes even more important when one considers that the Maximum Permissible Exposure (MPE) of the major standards, such as IEEE C95.1-1991, vary by 20 dB over the communications bands (see Figure 1).

If the measured value is below the most restrictive level, which normally occurs in the 30 to 300 MHz band, then a true RMS measurement from a traditional "flat response" probe will provide all the information that is required. However, if the measured value is greater than this limit, the site or area may still be compliant, depending on the relative contributions from signals outside this human resonance region.

For example, a mixed site with AM, FM, and UHF signals may indicate a level of 5mW/cm². The question, however, is how much of this energy is coming from each emitter? If only a small amount of energy is coming from the FM antenna, the overall measurement of 5mW/cm² may still be compliant, even though the limit for 30 to 300 MHz is only 1mW/cm².

This effect is demonstrated in comparing the signal levels in Figures 1 and 2. In each case, a total power of 5mW/cm² is measured. However,

Figure 1.

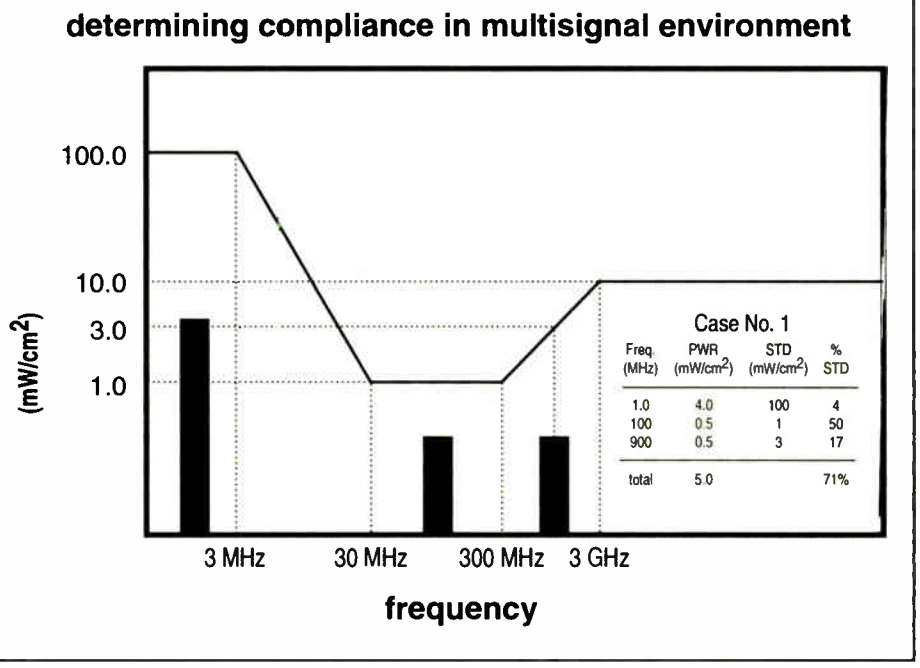

Figure 2.

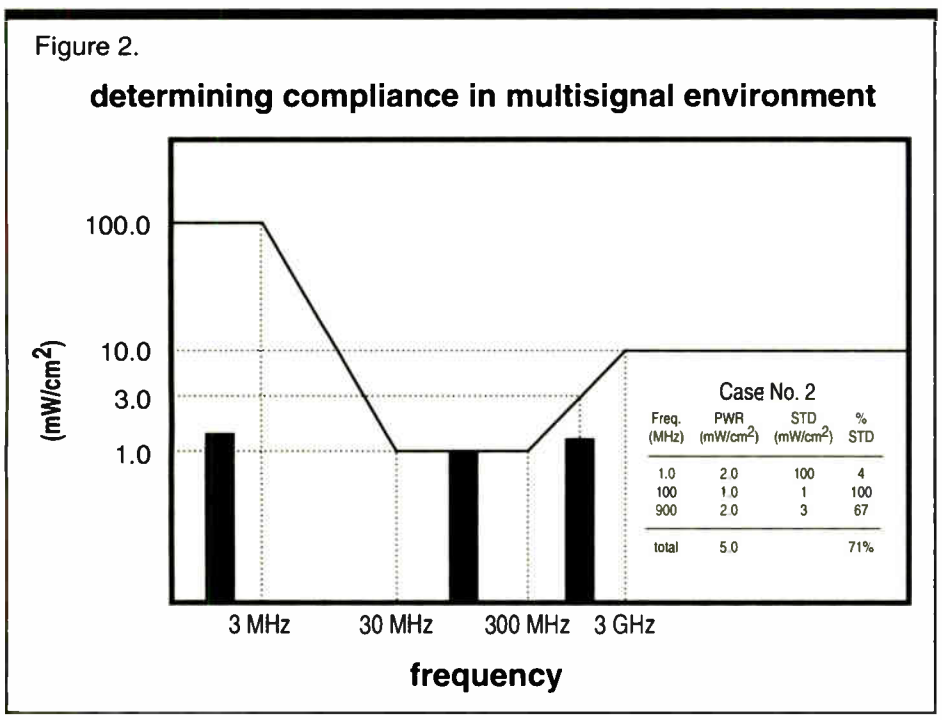

Figure 1 shows 71 percent of standard while Figure 2 demonstrates 169 percent of standard for the same total power of 5mW/cm².

Quantitative value

An accurate RMS measurement of the total RFR level, with all emitters operating at maximum power, provides a quantitative value, but may not yield the answer to the most important question: Is the site RFR level compliant with the standard?

Until recently, there were two solutions to this question. The first was to turn off all the emitters except one, and make individual measurements of each emitter separately. Engineers have been forced to all but abandon Sunday night maintenance sessions, and trying to coordinate a complete emitter shutdown is virtually impossible these days.

The second solution involves using narrow band instrumentation. This solution, though effective, is very time consuming. Every emitter has to be measured at every location. Typically, a directional antenna is used, meaning three measurements are required for every emitter at every location (one in each plane). The uncertainty of these measurements can be as much as 6 dB.

The recent introduction of shaped probes by Loral Narda alleviates the guesswork, and simplifies the measurement procedure. Introduced at the NAB, all that is required when using a shaped probe is to ensure that everyone is operating at maximum power. This type of cooperation is much easier to obtain.

When connected to a survey instrument, the shaped probe reads out in percent of standard. Narda's patented

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World Radio History

I want a console...

No problem - the Dynamax MXE Series Console can handle it!

Dynamax MXE Series consoles offer the right set of features to match a variety of format and equipment scenarios.

Opto-isolated remote module control and Euro-style terminal blocks allow easy, direct interface with your automation system. Since fewer inputs are normally required for automation/satellite based systems, the 8 channel version provides a cost effective alternative to bigger consoles.

The MXE's multiple output capability and optional telephone interface help make talk shows a breeze. With pre-fader patch points for outboard processing, optional 5-Band mic EQ and the ability to wire each input for mono or stereo these consoles can be effectively used for production when not being used on the air.

Regardless of your application, Dynamax MXE Series consoles provide bullet-proof reliability due to true modular motherboard design, superior components such as P&G faders, dbx VCA's, AMP connectors, plated steel construction and Lexan control surfaces. Available in versions from 8 to 18 channels starting at about $4,000, the MXE Series consoles provide a tremendous value.

So if you're looking for a great all-around console you don't have to pay an arm and a leg for - the Dynamax MXE Series console is the obvious choice!

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World Radio History

Future Glimpse: Pulse Reflectometry

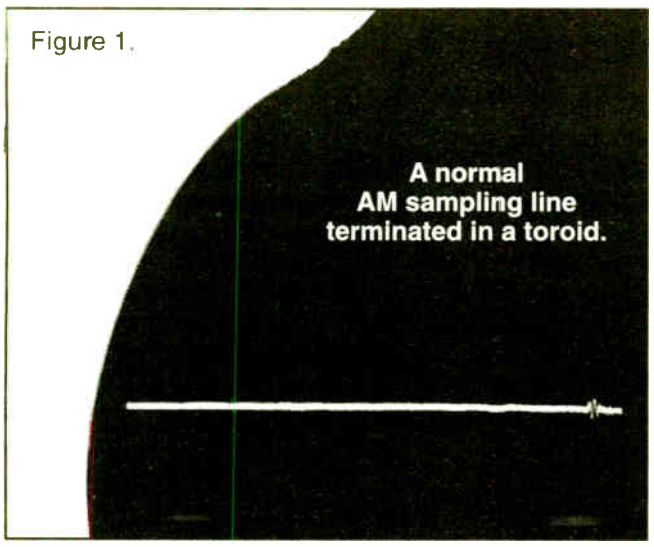
by John Bisset

SPRINGFIELD, Va. Engineers have a multitude of metering at their disposal to monitor transmitter performance. With the exception of the reflected power meter though, what happens between the output of the transmitter and the antenna is akin to "black magic." Yes, we can hear the results by monitoring on the radio, but what is really going on inside that transmission pipe?

A time domain reflectometer (TDR) or high power pulse reflectometer (PRH) provides the answer to this question. Both instruments achieve the same goal—that of analyzing the transmission line characteristics. In either case, a short duration gaussian pulse of energy is coupled into the transmission line being measured. A time versus amplitude display of the echoes reflected from imperfections along the line or the load itself permits detailed analysis.

In addition to its pulse generation circuitry, a typical TDR may include a chart recorder and/or display CRT. These additional features help drive up the cost of the instrument.

Figure 1.



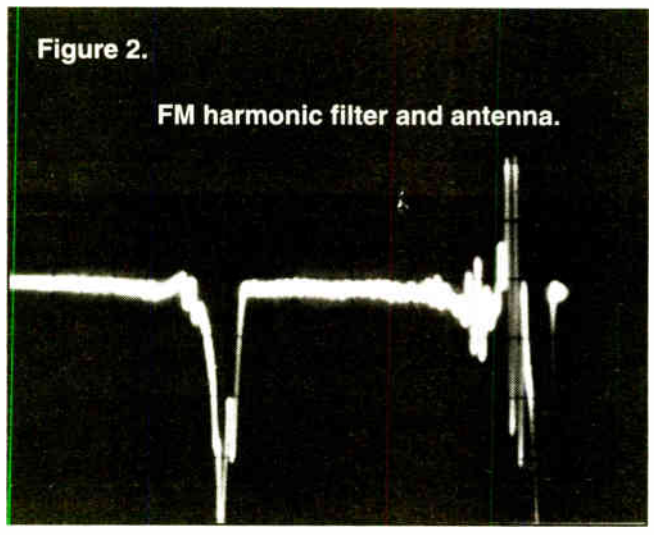
Power pulse

Usually a portable instrument, the TDR generates a relatively low power pulse which is coupled into the line. Because of the low power used, the echoes are particularly weak. Just as strong microwave signals transmitted near a satellite receive dish can disrupt reception of the very low-powered satellite signal, so can transmitted energy from adjacent antennas disrupt or damage the traditional TDR. A solution to this problem is to turn all adjacent stations off, while the line is pulsed. In today's environment this is neither preferred nor likely.

An alternative to the traditional TDR is the High Power Pulse Reflectometer or PRH. This instrument, manufactured by Delta Electronics, was especially designed to operate in high RF fields. In addition to being capable of generating a very high voltage/low current/short duration pulse (easily adjustable up to 5 kV), the instrument can withstand 500 watts of continuous induced power from adjacent transmitting antennas.

A time versus amplitude display of the echoes reflected from imperfections along the line or the load itself permits detailed analysis.

Figure 2.



Such power levels would easily "smoke" the traditional TDR. In fact, many of these instruments include warnings about determining line voltages from adjacent transmitting antennas prior to connecting to the transmission line.

At first glance, the engineer may be fearful about coupling a 5 kV generator to his line. Further analysis shows that because of the short duration of the applied pulse, the average power output is very low, and there is no fear of damage to the line. The PRH output is not dangerous, in fact, you can short the output of the instrument with your fingers, and not feel a thing. The PRH pulses can therefore be applied to even small transmission lines without fear of damage.

A second benefit to the High Power Pulse Reflectometer is its price. The instrument depends on an outboard oscilloscope to display the echoes. Because you are not paying for an integral CRT or chart recorder, the price is less for this kind of instrument. The PRH is provided with a 10-foot cable for connection to the user-supplied oscilloscope.

In addition to revealing transmission line trouble, "pulsing" a line gives a direct readout of transmission line length. A calibration chart transforms the oscilloscope sweep rate and the transmission line characteristics to permit a direct readout of length using the scope graticule.

Depending on the type of line and sweep speed, each centimeter on the graticule is equal to a specific number of feet. Should a fault or anomaly be observed, it is easy to determine exactly where on the tower the problem is located.

Figure 1 shows a "normal" length of transmission line used in an AM sampling system. The decaying "sine wave" termination, displayed at the right of this photo, is normal for a sampling toroid terminated in 50 ohms.

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Probes Ease Compliance

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shaped probes conform to the new IEEE C95.1-1991 Controlled Environment Levels or the Canadian Safety Code 6 Occupational Levels.

Multiple-frequency calibration

These new probes are calibrated at multiple frequencies, in the same manner as the flat response probes. Because their output is shaped or weighted for that particular frequency, a percent of standard measurement is easily obtained.

There are two uncertainties with this type of probe, however: frequency response and ellipse ratio errors. Both Narda's wideband and shaped probes have a tight response of ±2 dB. The ellipse ratio is ±0.75 dB or better, depending on the model. Calibration uncertainty represents another 0.5 dB, and the indicating meter itself is within a maximum of 3 percent.

Frequency response errors can be minimized by using a correction factor. This is especially useful for single frequencies or frequencies that are close, such as those in the FM broadcast band. In complex measurement locations, when there are a diversity of frequencies, however, a correction factor cannot be used.

Ellipse error is easily eliminated by rotating the probe about its axis and selecting the mean value. (This is how the probe is calibrated.)

According to NARDA, a good rule of thumb is that the total uncertainty or measurement error should not be greater than 3 dB. With a shaped probe, an indication of less than 50 percent is guaranteed to be compliant, while an indication of greater than 200 percent is guaranteed to be non-compliant. In actual practice, the areas that fall in this window of uncertainty are small. In the worst case, if these areas are important operationally, narrow band measurement techniques could be used to resolve the problem in these small areas.

A good method of mapping the area where compliance is guaranteed is to set the meter to 50 percent of standard, and quickly map the area where the indicating instrument does not exceed 50 percent. In this manner, the resultant plot can be easily used to determine RFR compliance.

Narda manufactures four different models of compliance instruments. Each ranges in frequency, measurement range, type of standard, and type of field. For more information on NARDA's shaped probes and RFR measurement systems, circle ***Reader Service 129.***

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World Radio History

Future Glimpse: Pulse Reflectometry

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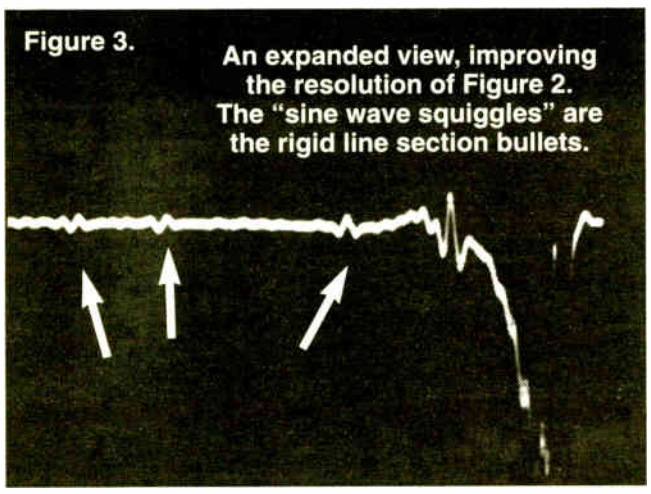
Unlike the traditional TDR, this measurement was made while the AM station was operating with its full 5 kW output. The sample line was disconnected at the antenna monitor, and the pulsing was recorded. Although a substantial amount of energy was coupled into the PRH from the tower under inspection, there was no degradation of the measurement.



The PRH instruction manual includes a number of characteristic traces to make identification of faults or anomalies easier. The oscilloscope display will typically show the initial pulse on the left, followed by the echoes caused by faults or other imperfections like bullets, splices, etc. The line termination is displayed on the right.

A downward spike is indicative of a short circuit. Such a display would be seen in a harmonic filter, represented in Figure 2. In this photo, the output of the filter is then coupled to the transmission line, and the display at the right is the antenna trace.

Unfortunately, antenna characteristics cannot verify antenna performance, other than by comparing photos of a working antenna under normal conditions to those traces viewed later after a problem has occurred. Different types and manufacturers of antennas do have their own characteristic displays, however.

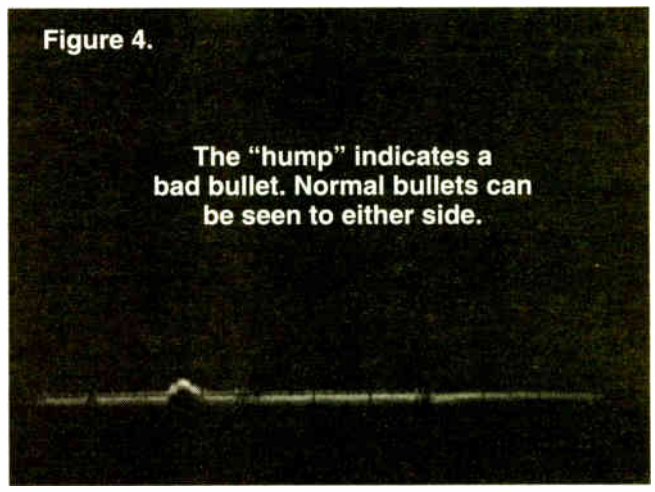
Excellent resolution can be obtained with the wider bandwidth scopes. In fact, the higher the bandwidth, the better the resolution. A 50 MHz scope works well with the PRH, but for enhanced resolution, as shown in Figure 3, a 100 MHz scope was used.

Figure 3 displays the same input to the harmonic filter as Figure 2. The resolution has been improved, however, and the little "sine wave squiggles" are the actual bullets connecting the sections of rigid line. All is normal in this characteristic display.

The benefit of line pulsing can be appreciated by comparing the bullets of Figure 3 to those displayed in Figure 4. The "hump" was found to be a split bullet which had heated and deteriorated. By counting the bullets along the line, and verifying the distance as calculated by the scope graticule, it was easy for the rigger to locate the problem.

Pulsing of transmission lines has become fundamental for new installations providing the engineer with a picture of the system operating under normal conditons.

Diagnosis of this problem points out the benefit of routinely pulsing a station's transmission lines. Not only does such pulsing provide a base-line of normal operation, but should a problem be detected before it develops into a catastrophic line failure, the instrument has more than paid for itself.



In the case of Figure 4, the engineer reported no increase in VSWR or noticeable change in transmitter parameters to indicate a pending problem. Until disclosed by the PRH, the bullet would have continued to deteriorate until the joint flashed over, causing untold damage—not to mention off air time, because this station had no backup antenna.

Pulsing a transmission line is cheap insurance, especially for older systems that have been on line for many years. Pulsing of transmission lines has become fundamental for new installations as well, providing the engineer with a picture of his system operating under normal conditions. Comparison of the initial base line measurements with subsequent measurements as the years pass by provide the engineer with an overall picture of the health of his transmission system.

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Reader Service No. 185

World Radio History

Running Radio

Your Resource for Business, Programming & Sales

Look to Your Staff for On-Air Sparkle
See page 38

Do Not Neglect the Contest Rules

by Mark Lapidus

WASHINGTON Sweat was pouring down my face. There I was, arguing with a listener over whether or not she had just won $20,000 in cash. The station had promised to play 20 songs in a row during a music marathon. If it failed to do so, the first caller would win 20,000 bucks if able to tell us what songs had just aired.

Yes, we had just played 19 songs in a row intentionally and were expecting a winner. In fact, we had just named a winner. The problem was the disgruntled contestant who had been on the phone just prior to the winner.

Almost right

How did it happen? She had made it all the way to 18 song titles. I had even given her a hint on one of them. She'd liked that hint. She liked it so much she wanted a hint on the last song. I wouldn't give it to her and that's when she got mad. Her reasoning was that if I was willing to give her a hint on a song beforehand, I was required to do it again. I had said I was sorry, hung up and proceeded to take another caller who got every title on the money. The saga of the angered caller quickly escalated, and after calling the general manager, she called an attorney. Before you could say "What hit the fan in here?" I had three people in a production room reviewing tapes.

There was only one thing that saved me: contest rules. We've covered the whys and how-tos of contesting in other articles, but we've never hit the specifics of rule-making. It's a dull, emotionless topic. It's also an area that can save your job, just like it did mine that day.

If there is a contest on your radio station that you administer, then you need rules. Do not let an account executive or anyone else tell you rules aren't required because "the client is giving this away... we are just helping." The key word here is "administer." Ask yourself these questions: 1) Do I supply the contestant with all or part of the prize? 2) Do I issue the 1099 tax form? 3) Do I make the arrangements for registration boxes, pickup of ballots and the selection of a winner?

The problem was the disgruntled contestant on the phone prior to the winner.

If you answered yes to any of the above, you are responsible for the rules. Some stations even go so far as to require clients to supply rules for contests that are truly just client contests. It never hurts; those rules may help you solve a problem that has become your own.

Who writes rules?

Generally, rules are written by the promotion or program director. For large contests, they should also be reviewed by the general manager. Some stations require attorney approval. Very few stations or groups have the old Standards and Practices Department of years gone by. The truth is that once you have a few basic sets of good rules, you can do most of this without running up attorney's fees.

Review what you have on the air now. The big contests are obvious and require immediate attention. However, even if you hear jocks giving away something as small as a compact disc, there should still be contest rules. It is a good idea to write a set of generic "numbered caller" rules that apply to all of these small contests.

Form: There is no correct way to write this, but I've adopted a simple format that prompts me to remember what is missing. What follows is a standard set. Feel free to use this, but understand that you may wish to review it with counsel before you sue me for leaving something out!

At the top of the page, state the prize and what it includes. Follow this with how to win and all the exclusions. Here's a sample:

The prize: A trip for two to Memphis to have breakfast with a large man who resembles Elvis. This includes round-trip air transportation (coach) from Washington to Memphis, ground transportation in Memphis, one night's accommodations at a two-star hotel, one continental breakfast and $50 to cover two meals. (Be very specific. Example: ground transportation in Memphis only.)

How to win: From 6/1/95 to 6/10/95 complete an official registration form at any Washington-area McNonnel's or listen to W---. The winner will be selected by a random drawing of all entries received and announced 6/13/95 at 7:30 a.m. on W---. The winner will also be notified by telephone and, if necessary, by overnight delivery. If the contestant does not claim the prize within 48 hours of notification, the prize is forfeit. Relatives or friends may not claim the prize for the contestant.

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World Radio History

Radio's Golden Era Favorites

by Richard W. O'Donnell

PORT RICHEY, Fla. "The Jack Benny Show" was easily the most popular radio series of all times.

The late Orson Welles' controversial "War of the Worlds" was, without a doubt, the greatest single program ever.

And "Grand Old Opry" rated right up there with the lofty "Voice of Firestone" and "Kraft Musical Hall" among the favorite musical shows of the Golden Age of Radio.

Ironically, the CBS Mystery Theatre, a product of the 1970s, ranked with Suspense and Lux Radio Theatre, two favorites of the vintage years of the '30s and '40s in the dramatic field.

Here are some of the results of a poll of 250 radio buffs from all parts of the nation. They included members of the Old Time Radio Club, the Radio Collectors of America, the Friends of Old Time Radio and other groups, as well as radio buffs in practically every state. In all, almost 500 ballots were mailed out. About half responded.

For the most part, those polled were the men and women who collect vintage radio shows and have read just about every book, magazine or article ever published on the subject.

Radio's skinflint

Jack Benny, radio's mean old skinflint, who also enjoyed success in the movies, television and on stage, won by a landslide as the favorite male performer of all time. His Sunday evening radio show was also an easy winner.

According to the buffs, the top 10 radio series of all time were:

1. The Jack Benny Show
2. Fibber McGee and Molly
3. Suspense
4. Lux Radio Theatre
5. Amos and Andy
6. Fred Allen Show
7. Lum and Abner
8. CBS Mystery Theatre
9. The Lone Ranger
10. The Shadow

Mercedes McCambridge

The top 10 male performers were:

1. Jack Benny
2. Fred Allen
3. Orson Welles
4. Jim Jordan
5. Brace Beemer
6. Bing Crosby
7. Edgar Bergen
8. John Brown (Damon Runyon Theatre)
9. William Conrad (Escape)
10. Elliott Lewis (Suspense/Alice Faye-Phil Harris Show)

The top ten female performers were:

1. Agnes Moorehead
2. Marian Jordan (Fibber McGee & Molly)
3. Mercedes McCambridge
4. Gracie Allen (Burns & Allen)
5. Gertrude Berg (The Goldbergs)
6. Eve Arden
7. Barbara Luddy
8. Janet Waldo
9. Joan Davis
10. Jane Ace (Easy Aces)

Actually, there were no real surprises among the male performers. In addition to starring on the Damon Runyon Theatre, John Brown was Thorny on "Ozzie and Harriett," Al on "My Friend Irma" and Digger O'Dell on "The Life of Riley." William Conrad achieved fame as TV's "Cannon" after years of anonymity on radio playing a variety of splendid dramatic roles. Elliott Lewis and his wife Cathy appeared on countless radio shows, and rank among the great stars of the airwaves. Television's Perry Mason, Raymond Burr, almost made the top 10 list. Others who deserve mention include Bob Hope, Hans Conreid, Ronald Coleman, Gale Gordon, Mel Blanc, Arthur Godfrey, Frank Lovejoy, Howard Duff, Ezra Stone, Dennis Day, Mason Adams, Les Tremayne, Hal Perry, Basil Rathbone, John Dehner, Paul Frees, Mandel Kramer and Barton Yarborough.

The Bryant Gap Episode is the key one in the "Lone Ranger" series. It explains why he became the man in the black mask.

Among the female performers, the names are all relatively familiar. Agnes Moorehead made radio history with her performance in "Sorry, Wrong Number." She was also the original Margo on "The Shadow." Orson Welles rated Mercedes McCambridge as the greatest of all radio actresses. Others who scored high in the voting include Georgia Ellis, Laureen Tuttle, Minerva Pious, Ireene Wicker, Mary Livingston, Judy Canova, Marie Wilson, Ann Sothern, Fannie Brice, Verna Felton, Virginia Gregg, Bea Benedaret, Rosemary DeCamp, Alice Faye, Tallulah Bankhead, Claire Trevor, Jan Miner, Harriet Hilliard Nelson and, of course, Cathy Lewis.

Carol Lombard and Jack Benny

The top radio comedy teams, according to the radio buffs, were:

1. Fibber McGee and Molly
2. Amos and Andy
3. Edgar Bergen and Charlie McCarthy
4. Lum and Abner
5. Easy Aces (Jane and Goodman Ace)
6. Abbott and Costello
7. Burns and Allen
8. Alice Faye and Phil Harris
9. Ozzie and Harriett
10. Bob and Ray

The 10 greatest single radio shows of all times were:

1. The War of the Worlds (Mercury Theatre)
2. Andy Plays Santa (Amos and Andy)

A young Orson Welles

3. Bryant Gap Episode (The Lone Ranger)
4. VA Hospital Show (Truth or Consequences)
5. Sorry, Wrong Number (Suspense)
6. Chicken Heart (Lights Out)
7. A Christmas Carol (Campbell Playhouse)
8. Funeral of FDR (CBS with Arthur Godfrey)
9. Your Money or Your Life (Jack Benny Show)
10. The Thing on the Fourble Board (Quiet Please)

There are some surprises on this list. The Bryant Gap Episode is the key one in the Lone Ranger series. It explains why he became the man in the black mask. In

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- G.722 at 7khz for lowest delay and/or compatibility.

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World Radio History

Preferred Web Sites for Radio

by Alan Haber

ALEXANDRIA, Va. Welcome to the region of cyberspace that can only be inhabited by the World Wide Web junkie known as... me. The name of this out-of-the way region? It could be, and is, nothing less than... HaberSpace.

Thanks for the kind words by e-mail, folks. It is nice to know you are out there (as opposed to in here, wherever that is). I have been working hard (just take a gander at the drawing if you need proof) at digging up the latest need-to-know information about radio on the electronic frontier that your station can use to safely and effectively propel itself into cyberspace.

Site of the month

One could say I am a little pooped. But I am ready to forge on anyway. In fact, starting here and now, I will be recognizing the nifty Neat Site of the Month. My first winner is (electronic drum roll)... WNNX-FM "99X" in Atlanta.

The new rock station's home page features a really cool, colorful depiction of the 99X studio by comic book artist Chris Hunter. Visitors can click on nearly anything in the drawing and be taken to such things as pictures and bios of 99X personalities, and a schedule of upcoming station promotions.

WNNX's home page

This is an example of a Web site well done. Kudos to 99X, and midday personality (and radio historian and Internet Guru) Steve Craig, who works on the site.

Lots of links

Since I left you last month, I have been compiling a list of Web sites that provide a wealth of information your on-air personalities may be able to use, all the way from the sublime to the ridiculous. These sites are also called links, because you can link to them from other sites.

Actually, it has only been in the last couple of months that I have been associating the word "link" with anything other than breakfast sausage and the proverbial, suburban chain link fence, but I am getting the hang of it. I am guessing you are too, because more radio stations (like yours, perhaps) are claiming their little plots of land in cyberspace all the time.

Before I share with you 10 of my favorite Web sites, a word of caution: Be sure to contact all sites, including the ones listed below, for permission to air any of the information contained on them. You may or may not get it—permission, I mean, but it is always worth a shot. An e-mail message should do the trick.

Now, without further ado, and in no particular order, here they are (you can exhale now):

1. The Cool Word of the Day is offered daily ('natch) at http://www.dsu.edu/projects/word_of_day/word.html. Just think how dictionary-smart your personalities will sound after visiting this site (on which you can prompt listeners to submit their own cool words).

2. It is just getting going in its home on the Web, but The Noble Directory of Experts & Spokespersons (http://www.catalog.com/experts/) looks like it is going to be a barnburner for those times when you need a talking head or chief muckety-muck to expound on the virtues of this or that on your morning show.

3. Here is a yummy site your midday personalities can use (during their lunch-time request shows, for example): The Internet Lunch Counter (http://speckle.nc sl.nist.gov/~lorax/lunch-counter.html) lets them "order" lunch with a simple mouse click (their "order" quickly appears on the screen).

If they do not like what is delivered (I got salami on a bagel, a banana (ripe, of course), and a can of diet Sprite (although I would have preferred regular, instead). Your personalities might be able to hold contests

with listeners to guess what lunch has come up on the screen.

continued on page 26 ▶

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World Radio History

Preferred Web Sites

▶ continued from page 25

(By the way, if your personalities do not like the lunch they get, they can send it back and "reorder." I got a ham and cheese sandwich on whole wheat, an ice cream bar and a can of iced tea on my second try.)

4. The Internet edition of The New York Times' daily TimesFax is available at http://nytimesfax.com/index.html. TimesFax is an eight-page condensed version of each day's edition. Call TimesFax publisher Patricia Ecke at 212-499-3391 for permission to re-use any material from the electronic publication.

5. If your personalities have listeners who are video game freaks, the Classic Video Games homepage might be of interest. Connect to http://www2.ecst.csuchico.edu/~gchance/ for information on the classic video game platforms of yesteryear.

6. Stations that broadcast chart shows might have some fun with the weekly Top 40 analysis provided at http://www.glas.apc.org. It might be interesting to listeners to juxtapose a station's chart with the U.K. charts.

7. Air personalities love lists of all kinds, so they will likely find information included on the Top 10 What? Web site at http://www.southwind.net:80/~rjones/top10.html grist for their particular mills. Internet surfers send in their own lists, which are posted on the site. Your station might be able to run a contest to find the best lists from listeners, and shoot them up to the site's Webmaster.

8. For information about science, art, nature and technology, San Francisco's The Exploratorium cannot be beat. The Exploratorium's Web site, at http://www.exploratorium.edu/, has a wealth of interesting information on-line about a wide variety of topics, in the form of pictures and sounds.

9. Saturday Night Live is one of television's best-loved shows. It might be fun to refer to some of the show's best moments on your station. Check out the Saturday Night Archives at http://www.best.com:80/~dijon/tv/snl/ —you will find, among other things, information on recurring SNL characters and commercial parodies.

10. Just about everything your air personalities would want to know about the boob tube, from TV stations and the networks to particular programs, is on offer at TV Net. 'Nuff said. Check it all out at http://TVnet.com/TVnet.html.

Well, those are some of my favorites. What are some of yours? E-mail me your picks at the address below, and I will share them with readers in a future column.

Etc.

A couple of readers e-mailed me about having trouble getting connected to the FCC's Web site. Sorry about that—a couple of characters in the site's address became mangled in cyberspace. Try this address instead (it's shorter): http://ftp.fcc.gov:70/.

And, speaking of addresses, here are two that might come in handy for those of you trying to find NPR and WQAM(AM)-WKIS-FM's Web sites (both were featured in last month's column): http://www.npr.org and http://prod1.satelnet.org/wqam/.

Until next month, keep letting me know what's happening in your area of cyberspace. E-mail me at zoogang@ix.netcom.com anytime, day or night.

Contest Rules

▶ continued from page 21

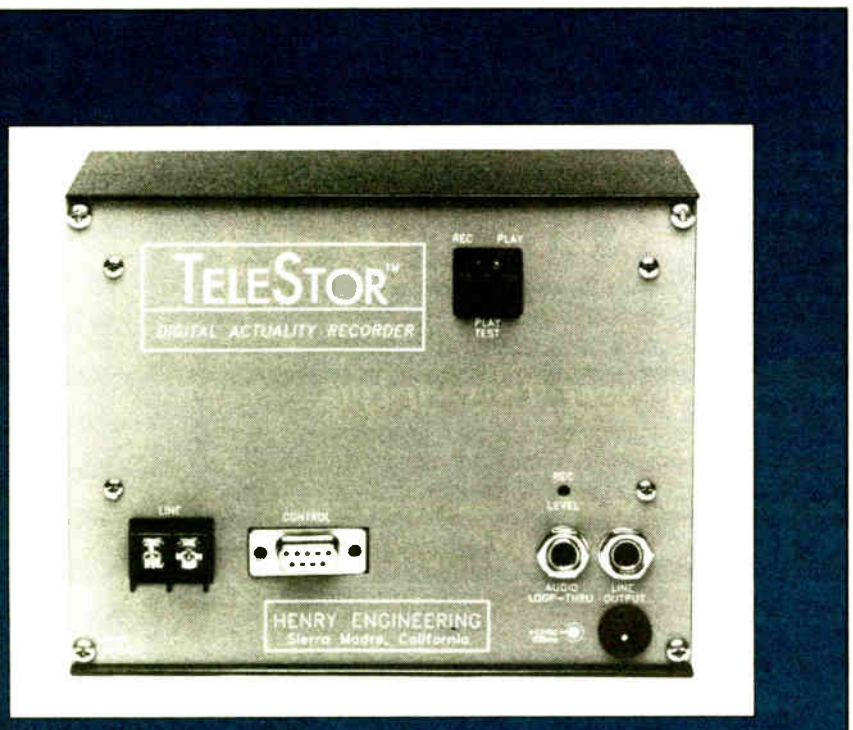
Entry forms must be complete and legible to be eligible. Enter as often as you like. No purchase necessary. Void where prohibited by law. You must be at least 18 to win. If winner does not claim prize, it will be awarded again. Winners must sign a liability release and a statement that they have read and will comply with these contest rules. In the event of a dispute, the decision of W--- management is final. Contest fraud will result in forfeiture of prize.

Prize pickup: The best way to assure winners sign the forms and get the prize in one piece is to have them come to your station. This way you're able to see identification and answer questions in person. If you must mail, send them the paperwork first. Never send the prize until you've got signed papers. Once th papers arrive, send the prize overnight or certified so you can prove delivery.

You don't ever want someone to call you about sending another set of front row tickets to the Eagles' sold out concert. Finally, don't forget that liability release form. I'd give you the details on that one now, but my editor would have to hurt me for taking up so much space. Happy ruling!

□□□

Mark Lapidus is director of marketing for Liberty Broadcasting. Liberty owns stations in Washington; Baltimore; Richmond, Va.; Long Island and Albany, N.Y.; Hartford, Conn.; and Providence, R.I., and broadcasts the "Wolfman Jack Show" nationally on The Liberty Radio Network.



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World Radio History

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World Radio History

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World Radio History

MANAGER'S NOTEBOOK

Hiring and Firing Price Is High

by Sue Jones

BURKE, Va. "YOU'RE FIRED!!" How many times have you wanted to scream (or have screamed) those words at a subordinate who has irritated you one too many times or created one too many problems at the station? You should consider several things before you do; it is not a decision that management should make in an angry or frustrated moment.

For instance, you should never say these words without some effort to counsel a person on substandard achievement, outlining specific steps he or she must take to improve performance. You should also give the employee enough time to demonstrate improvement. Another important matter to consider before you terminate an employee is the cost to replace that person.

The first question you'll have is: "Where will I find a replacement?" The next thought will probably be: "What is my resource pool?" You may not have one. So, you think, "how hard can this be? I'll run an ad in the newspaper, maybe do a trade for air time."

Few managers do a full cost analysis of recruiting, hiring and initiating staff members. Yet the numbers can add up quickly.

Depending on the position, you might place an ad in one or several trade publications. This process will take at least two to four weeks, from the time you call to set up the ad to the time you begin to receive résumés.

You might also consider talking with your industry friends and colleagues in the local market.

At what cost?

Two weeks after you've dismissed the employee, you'll start to notice that the work he or she left behind is piling up, undone. Possibly your other staff members are getting edgy trying to juggle their regular jobs with tasks they've had to take on because there is no one else that's yet been hired to do them. The result is that neither job is well done, the staff is bordering on mutiny and you don't have a suitable candidate to take the position because you have not had the time to conduct a search and interview. Your work and costs are just beginning.

The cost to hire is one of the most overlooked expenses. Few managers do a full cost analysis of recruiting, hiring and initiating staff members. Yet the numbers can add up quickly.

Budget effect

Many professional recruiters hesitate to create a formula or give a percentage of salary as a measure of staff replacement costs because markets vary widely. However, most will agree that replacement cost for professional positions is generally 15-25 percent of the base salary of the position. That means a $40,000 per year position will cost approximately $6,000 to $10,000 to replace. Keeping your annual salary budget in mind, these costs are in addition to the $40,000 salary that you budgeted, unless you added recruiting costs to your budget. Now that $40,000 salary could cost $50,000 or more this year.

If you have more than one vacancy to fill in a year, these types of costs are multiplied by that number of vacancies. If you have to replace three $40,000 staff members in one year, you could add $30,000 a year in basic recruiting costs.

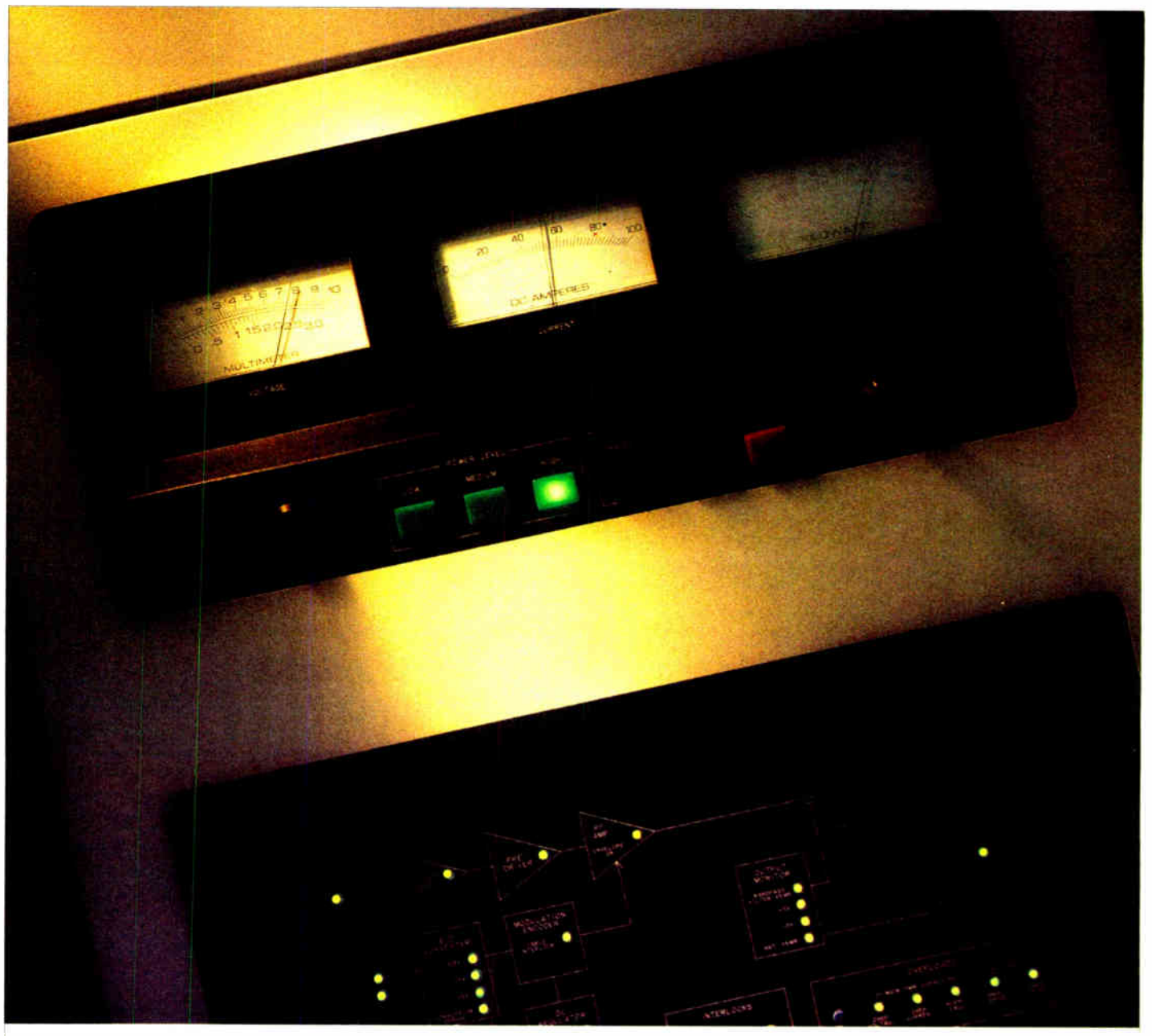
If you decided to let a search firm handle the search and initial screening for air talent or senior management positions such as sales manager or program director, add these costs to the basic costs. Many search firms will not guarantee a hire; they will only provide you with screened candidates. If you have employee referral bonuses for recommending a candidate who is hired, add that figure to the costs. If your office manager or department head is given responsibility to find suitable candidates, some of their work may be incomplete or slower than normal because time is being devoted to the recruiting task.

Even if you work with the local university or college to recruit from the new graduates, someone's time will be used to screen résumés and perhaps conduct the first interview. If you have the luxury of talking with potential candidates at trade shows, you still must devote some of your time to that process instead of to the show.

The price you pay

After you have decided on three to five potential candidates, you'll begin the interviewing process. Successful interviews usually take one to two hours. Multiply that figure by two or three interviews; one screening interview, and two in-depth interviews conducted by management. Once a final candidate is identified, the reference and background

continued on page 35 ▶



Its mother was an accountant.
Its father was a Maserati.

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On the one hand, DX Series transmitters are a solid investment. In fact, their ability to quickly pay for themselves has been proven in more than 500 installations worldwide. Efficiency is the key. Typical overall efficiency up to 86 percent dramatically reduces energy costs and practically pays for the transmitter itself.

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On the other hand there is performance. High quality, FM-comparable audio performance takes the Harris DX Series right to the top of its class. And you can count on performance that lasts. The MTBF rating for Harris RF modules is 6 million hours.

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World Radio History

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  use it for Live On Air, Production, and Automation !
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  No carts to lose, jam, or destroy
  No routine maintenance, no heads to adjust, no cleaning
  No carts to replace when a hard disk lasts an average 15 years
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- ***Digilink costs less than tape equipment.***
  The average Digilink with 10 hours of stereo storage is under $8,000
  The $8,000 list price includes 600 one minute carts worth of storage
  That means a Digilink is a $5,500 machine with $2,500 in media
- ***Our Gemini Live On Air pushbutton control puts carts at your fingertips***
  for fast On Air operation, every jock can even have his own set of carts
- ***Digilink performs 8 channel multitrack editing for under $2,000 !***
  -or- use our stand alone Trak*Star multitrak Editor for under $6,000 !
  The only multitrack radio editor that can provide 100% On Air backup !
- ***Network News, Production, Air, and even Traffic... over 15 studios !***
  to transfer audio, text, & schedules in perfect digital on our network

World Radio History

DIGILINK

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We are #1, because we are leading the way...

With over 1,000 workstations sold, Digilink is by far the #1 digital audio system for live On Air radio, Production, and Automation. Digilink has achieved this unique success because it is easier to use, does much more, and costs less than any other digital product on the market today.

Digilink does more than other systems because of its abilities in On Air with live, CD, & satellite; in production with its multitrack editor; and in news with text. This makes it so that a Digilink workstation can be placed in each studio of your station to replace cart machines, reel machines, CD players, and often even consoles. At an average price of under $8,000 per studio, Digilink is actually less expensive than the tape equipment that it replaces while giving you CD quality audio performance, an average media life of over 15 years, and equipment that requires no routine maintenance. You can even create a digital highway around your station by connecting all of your Digilink workstations and scheduling computers on our digital network to transfer audio, text, and schedules in perfect digital between studios.

With it's ability to *simultaneously* record, play, crossfade, and network transfer, a single Digilink workstation can do all that is required for recording and playback for an entire studio. It is literally a studio in a box. It can be crossfading out of a CD into a hard disk song, dropping a hard disk jingle over the middle of the crossfade, recording a network audio feed for later playback, and receiving a new spot over the network from the production workstation. Digilink is the complete digital solution to your radio station's studio needs.

To create a *professional* digital broadcast solution you can't simply buy a digital audio board and IBM PC computer. Therefore, Arrakis builds our own DSP board; SCSI board; I-O board; audio routing switchers; video switchers; and modular, broadcast quality cabinets. This makes Digilink remarkably powerful with radio specific features such as digital crossfade and Trak*Star multitrack editing. This also reduces cost so that we are able to sell Digilink for as little as 1/2 the price of other products which have to buy less powerful cards and mark them up. Perhaps most importantly, building Digilink ourselves assures you of long term customer support from a single *broadcast* source. With Digilink, you don't have to be a computer expert, because we are.

Whatever your studio needs- to replace a cart machine, add a new production studio, or add some level of automation, Digilink can do the job. Put a Digilink in one studio today, another next year, add a scheduling computer and network, and you will eventually discover that you have painlessly gone digital one step at a time. There is no question that Digital audio is here *TODAY*- it improves your sound, speeds your production, increases your reliability, and reduces your costs. Call and find out why Digilink is #1 and why customers come back again and again: customers like the United States Air Force who have selected Arrakis Digilink, consoles, and furniture for all of their radio stations worldwide.

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World Radio History

STATION SERVICES

News and Services for Business, Programming and Sales

Don Owens Organizes "Class Reunion" for COPRA Media Productions

DALLAS Don Owens, former assistant program director for KLUV(FM) in Dallas, has joined COPRA Media Productions Inc. as promotions/production director.

COPRA produces "Class Reunion," a four-hour, syndicated program featuring rock-n-roll hits of the '50s, '60s and '70s. Owens will coordinate promotional opportunities with the more than 40 affiliates currently airing the show, and will also assist with the show's production.

For information, contact Linda Cowley at COPRA at 800-985-2665; or circle **Reader Service 101.**

The Sports Network Offers Its Service to Libraries Free of Charge

PHILADELPHIA The Sports Network (TSN), an international real-time sports wire, announced that it would furnish its service at no charge to any library whose users request the service.

While TSN is offering its wire service at no charge to libraries, it will require that the libraries purchase the receiver (or IDR) and antennae (KU or FM), as well as the vehicle of choice for receiving the information—printer, display board, computer, etc.

For further information, contact TSN at 215-947-2400; fax: 215-938-8466; or circle **Reader Service 32.**

Larry "Bud" Melman Brings Distinctive Humor to Radio

LOS ANGELES Calvert DeForest, also known as Larry "Bud" Melman of "Late Night with David Letterman," and Premiere Radio Networks, have signed an exclusive five-year agreement. Under the terms of the agreement, DeForest will host a mini-feature, based on his book *Cheap Advice*, that will air Monday through Friday. DeForest will also host unique long-form specials.

For more information, contact Ed Mann at 818-377-5300; or circle **Reader Service 183**.

Morningstar Beefs up Staff as Christian Music Format Grows

NASHVILLE, Tenn. Citing the network's continuing growth in the satellite-delivered Christian country and adult contemporary Christian music formats, the Morningstar Radio Network announced several additions to its staff. Steve Faulkner, former general sales manager at KNTL-FM in Oklahoma City, moves to Nashville to work in national sales. Lisa Guidry, a former account executive with WQCK-FM in Baton Rouge, La., takes on the newly created position of syndication associate. Tammy Meadows was named marketing assistant.

For additional information, contact Michael Stephen Miller, director, affiliate services, at 615-367-2210, or circle **Reader Service 90.**

Energetic Music Adds Broadcast CD to Its Library

SEATTLE In keeping current with the needs of the broadcast industry, Energetic Music has added a new CD, Broadcast No. 5, to its library. This disc is filled with :60s, :30s and bumper cuts, edited for commercials and 100 percent buy-out. This release offers 82 tracks, from seven seconds to 60 seconds, and a range of music formats, from rock to classical, new age to corporate.

This CD is part of Energetic's royalty-free music library; clients are licensed for unlimited use of the music on all of their projects.

Free catalogs are available by calling 800-323-2972; or circle **Reader Service 170.**

Ron Seggi Hosts Weekly Entertainment Talk Show on USA Radio Network

DALLAS The USA Radio Network announced an exclusive syndication agreement with celebrity talk show host Ron Seggi. This entertainment-driven talk show, originating from Universal Studios in Florida, was available beginning in May.

Seggi, whose program features a who's who of major celebrities in the music, film and television industries, offers a diversion from shock talk, which has inundated the airwaves over the past few years.

"Ron Seggi Live from Universal Studios Florida" will air on Saturdays, from 1 to 4 p.m., CST. For further information and station clearance availability, contact USA's affiliate relations at 800-829-8111; or circle **Reader Service 123.**

Clean it up with the easy-to-use TS612.

Every day radio and television stations are airing more and more talk shows. Unfortunately, they aren't upgrading their studio telephone equipment. The result is a virtual *waste dump* of operational errors and bad caller audio.

The solution is the TS612 from Gentner. Designed specifically for talk show formats, the TS612 features six phone lines (expandable to 12), Gentner's newest Superhybrids with internal mix minus generation, automatic caller level control, and digital audio enhancement for consistently clear caller audio.

Your talent will love the TS612's unique talk show features like VIP caller, four-line conferencing, and call screening. Plus, its built-in handset and key pad will make your talk show run as smoothly as your callers' mouths.

Don't wait a day longer to clean up your "talk sick" phone system with the affordable TS612.

Contact your Gentner dealer today and order your TS612, before your studio is designated as a Superfund site.

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Call Gentner for all of your telephone interface solutions, including conference calling services.

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World Radio History

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DESIGNS THAT MAKE THE DIFFERENCE

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World Radio History

LMAs and Duopolies Shape Radio

by Alan Haber

LAS VEGAS As the 1990s march on, duopolies, local marketing agreements (LMAs) and ownership changes continue to color the landscape for broadcasters determined to stay afloat in a sea of economic uncertainty and competition.

A standing-room-only workshop session at NAB 1995, titled Duopolies, LMAs & Ownership Changes: Creative Combinations in a Competitive Market, communicated the latest information that broadcasters need to know about these highly visible business situations.

The session, moderated by Jack Goodman from the National Association of Broadcaster's legal department, covered both radio and television. Goodman told the audience that "ownership is on everybody's front burner.

Roy Stewart, chief of the Federal Communications Commission's (FCC) Mass Media Bureau, said that, regarding the ownership of radio and television stations in a city, the commission generally says stations cannot do that, but "has provided three ways that you can get around the general prohibition." He said, "If you attempt to buy a station, like a radio station in a market where you have a television station, or vice versa, and that market is one of the top 25 markets, the commission will let you buy that if you can demonstrate that after the transaction is consummated, there will be at least 30 independently owned voices in that market."

The second way to combine a radio and television station, according to Stewart, "is if you buy what amounts to a failed station, either radio or television, so that you now have a combination of a radio and television ownership interest, but the failed station demonstration is that it has to have been at least silent and off the air for four months, or in a state of bankruptcy at the present time."

The third way of putting radio and television stations together in the same market "involves several factors that we're looking at (on) a case-by-case basis. What is it that you propose to serve as a public interest benefit? What kind of joint operating savings will there be? Demonstrate to us that you're not going to dominate the market. Demonstrate to us what kind of cost savings you're going to have, and how you're going to translate that into enhanced programming."

Present regulations

John Quale, a partner in the Washington, D.C., law firm Wiley, Rein and Fielding, addressed the FCC considering the creation of new incentives for minority and female ownership of broadcast stations. He talked about the current higher national limits in both radio and TV for stations controlled by a minority entity. In radio, he said, the national limit was raised last fall from 18 to 20, and, for minority control, it goes up to 25.

"Probably the most frequently used of the FCC's minority ownership incentives," Quale said, "is the tax certificate policy, pursuant to which the seller of a station to a minority-controlled group could defer the gain on the sale of the station by reinvesting the proceeds in another cable or broadcast system."

Attribution

Craig Blakeley, a partner in the Washington, D.C., office of Atlanta law firm Powell, Goldstein, Frazer and Murphy, covered the area of attribution, which he described as the types of interests that are going to be considered as cognizable and that should be looked at by the FCC for the purpose of evaluating compliance with ownership limits.

"It's important to remember," Blakeley said, "that when we talk about an attributable interest, the FCC doesn't mean one which is a controlling interest. It means, in the FCC's words, an interest which has a realistic potential to affect the programming and other core operational decisions of a licensee. So we're really talking not about control, but about influence."

Greg Schmidt, vice president, new developments, and general counsel of LIN Television Corp., tackled the topic of ownership rules, in relation to what Congress is doing, what the Senate has proposed and what could come out of the House of Representatives.

"Last year," said Schmidt, "bills were moving through Congress"; there was a little provision on broadcast ownership, he noted, that would have instructed the FCC to look over its broadcast ownership rules. That particular bill made it through the House, but died in the Senate. The same legislation, according to Schmidt, is alive again this year, and there is a much better chance that it will have what he called substantial deregulation provisions in it for broadcasting. He also allowed that there was a substantial chance that nothing might happen.

continued on page 37 ▶

Move Up from Carts to Touchscreen Digital Audio

Play Any Audio at a Touch

Nothing else makes radio as fast or easy as having all your spots, sounders and sweepers start with your fingertip–***always on-line and ready*** to play from hard disk. And ***nothing else*** makes your station sound as good or as exciting as touchscreen digital and creative talent with the ***new Scott Studio System!***

Here's how it works: Six buttons on the left of the 17" computer touchscreen play what's on your program log. Scheduled spots, promos, PSAs and live copy come in automatically from your Scott System Production Bank and your traffic and copy computers. You see legible labels for everything, showing full names, intro times, lengths, endings, announcer initials, outcues, posts, years, tempos and trivia. Your jocks can rearrange anything easily by touching arrows (at mid-screen), or opening windows with the entire day's log and lists of all your recordings.

On the right, 18 "hot keys" start ***unscheduled*** jingles, sounders, effects, comedy or promos ***on the spur of the moment***. You get 26 sets of 18 user-defined instant "hot keys" for your jocks' different needs.

Large digital timers automatically count down intro times, and flash at 60-, 45-, and 30-seconds before endings. You also get countdowns the last 15 seconds of each event.

The Scott Studio System is your ***best*** way to make the move to digital audio and eliminate troublesome carts. Each button on the touchscreen plays whatever you want instantly. All scheduled spots, jingles, promos and scripts come in from your traffic and copy computers.

The World's Fastest Playback!

Touch either of the two buttons at the top right of the main screen to see our "Wall of Carts" with all your audio ***on-line!*** Touch the sound, spot, jingle, promo, PSA or comedy you want and it plays ***instantly***. Or, you can put it anywhere you want in the day's schedule. Audio is displayed any five ways you like.

The Scott System also gives you a "Make Good" button so it's quick and easy to reschedule missed spots or promos.

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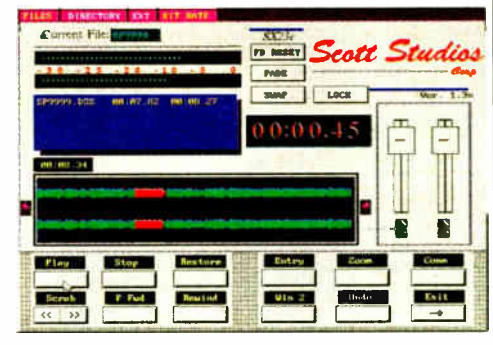

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World Radio History

Radio's Golden Era Favorites

▶ continued from page 22

1945, Ralph Edwards took his crew to a "VA Hospital" to cheer up a patient there. It was a heart-tugging show. A chicken heart kept on doubling in size on the celebrated "Lights Out" show. In time, it covered the world. "As for The Thing on the Fourble Board," a Quiet Please story, it was probably the greatest shocker ever sent out over the airwaves.

The top 10 soap operas were:

1. One Man's Family
2. Ma Perkins
3. Vic and Sade
4. Life Can Be Beautiful
5. Lorenzo Jones
6. The Goldbergs
7. Just Plain Bill
8. Myrt and Marge
9. Romance of Helen Trent
10. Stella Dallas

Benny Goodman

The top 10 adventure shows for young people:

1. The Lone Ranger
2. I Love a Mystery
3. Jack Armstrong
4. The Green Hornet
5. Tom Mix
6. Terry and the Pirates
7. Captain Midnight
8. Sky King
9. Sergeant Preston of the Yukon
10. Bobby Benson & The B-Bar-B Riders

The top musical shows:

1. Kraft Musical Hall
2. Grand Old Opry
3. Voice of Firestone
4. Big Band Remotes (Various networks)
5. Cities Service Band of America
6. The Telephone Hour
7. American Album of Familiar Music
8. Chicago Theatre of the Air
9. Your Hit Parade
10. Camel Caravan (Big Band Series)

Last but not least, the favorite news commentators:

1. Lowell Thomas
2. Paul Harvey
3. Gabriel Heatter
4. H.V. Kaltenborn
5. Walter Winchell
6. Drew Pearson
7. Elmer Davis
8. Bill Stern (Sports)
9. Boake Carter
10. Fulton Lewis

The second place vote for Paul Harvey, who is still a powerhouse on radio and television, has to be considered a bit of a surprise, since he was not a "big name" when the others on the list achieved their greatest fame. Also, the absence of Edward R. Murrow from the top 10 should be noted. It could be that Murrow's greatest popularity came during his years on television.

E.G. Marshall

I must emphasize that the voters in this particular poll were old time radio buffs, and that their selections may have been influenced by programs they have in their own private collections. Many great radio shows of the past have been overlooked, simply because transcriptions or recordings of them do not exist to keep their memories alive. For this reason, some of your old radio favorites may not be included in this survey.

□□□

Richard O'Donnell contributes regularly to RW. He can reached at 813-842-6638.

Cost of Hiring and Firing Is High

▶ continued from page 29

checks will require additional time to complete. You may delegate the background check to a subordinate. However, this task will use time intended for other regular tasks. Multiply the staffs' hourly salaries to determine the interviewing cost.

Depending on the position, additional recruiting costs might also include contract negotiations and preparation with your law firm. Other costs might include relocation fees and temporary lodging for the new staff member and family members.

Lost productivity and revenue

Certainly the most overlooked costs are the losses in productivity and revenue. If you have no administrative support for the sales department for two weeks, sales presentations will be delayed, resulting in lagging revenues. Billing and correspondence could also be impacted. If each sales staff member does his or her own administrative work, it will mean there is less time for sales calls, which further reduces revenue.

If you do not have an engineer and have an emergency equipment failure or malfunction during the recruitment period, you will have to secure outside engineering services to make critical repairs at a higher cost. Noncritical equipment that malfunctions will remain in that state until a qualified engineer is hired. If parts need to be ordered, that will further delay the repairs.

If your vacancy is an air staff member, a part-timer may fill the gap, but that part-timer can't produce quality spots or handle other duties that might be required of a full-time person.

If your receptionist position is vacant, other staff members will have to answer the telephones, receive visitors and complete other administrative tasks. Alternatively, you could call a temporary employment agency to provide a receptionist, for an additional cost.

Initiation fees

Let's say you sail through all of the above steps and hire the replacement in record time with minimal costs because the chosen candidate was recommended by an industry colleague. Keep in mind that the new recruit will not be fully productive in the new position for some time. Even if you hire a seasoned accounting or office manager, that person must complete a learning curve to know how work flows through your station. He or she will need orientation on policies and procedures for your station.

A new recruit's initiation can be delegated to a subordinate. However, that one-on-one training/initiation is very time consuming for the staff member who will be conducting the initiation until the new recruit is fully up to speed. This time can vary widely, depending on the recruit's experience and ability to adapt to the new environment.

These are most of the costs associated with filling a vacant position, but this is not an all-inclusive list.

Obviously, recruiting for vacancies can be a very expensive proposition. It should be undertaken only when all other corrective efforts have been unsuccessful.

□□□

Sue Jones is a senior manager for Computer Data Systems Inc. in Rockville, Md. She can be reached at 703-323-0491.

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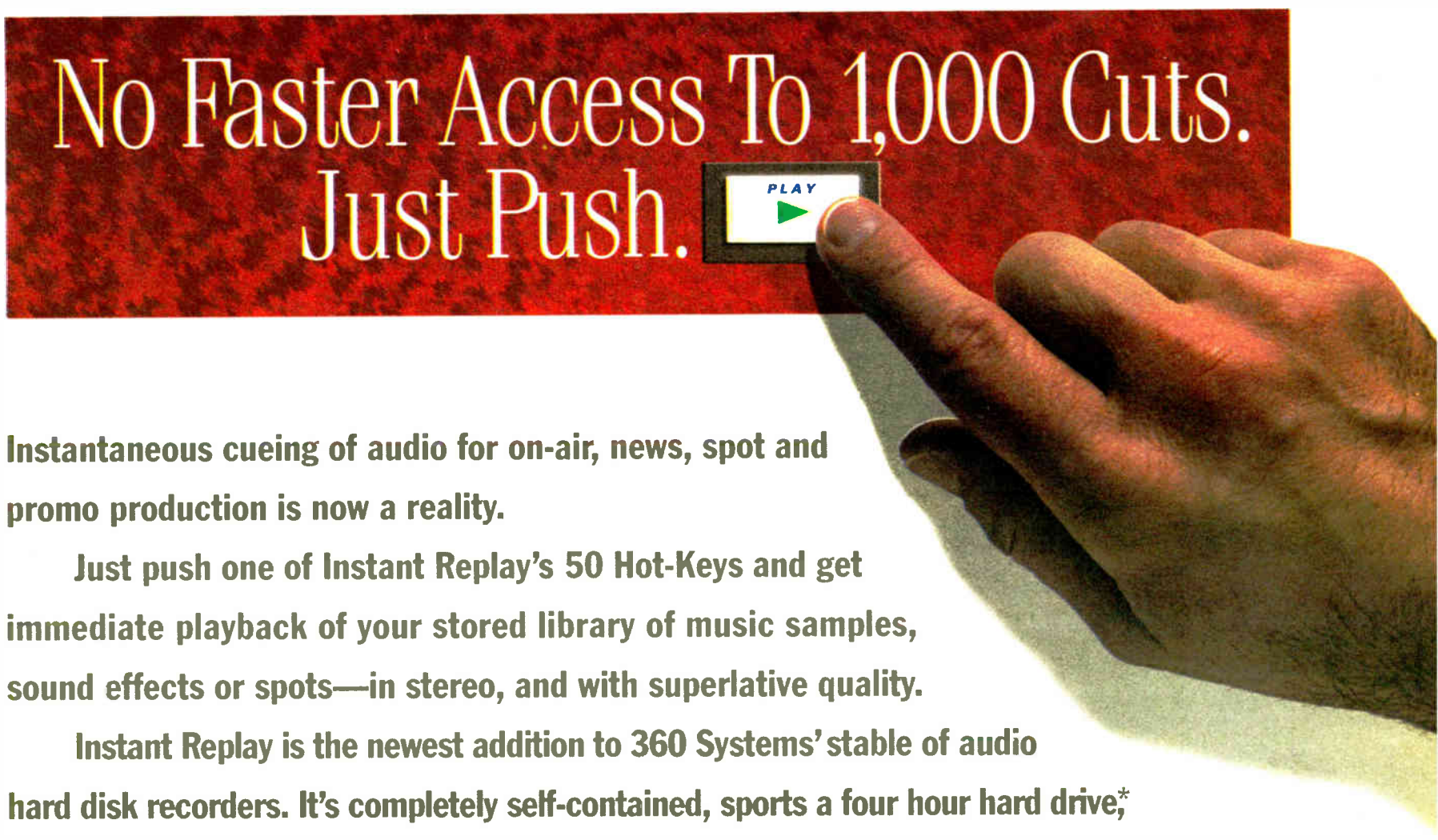

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World Radio History

Effective Ways to Upgrade Stations

by Thomas R. McGinley

LAS VEGAS Barry Umansky of the National Association of Broadcasters (NAB) moderated a lively interchange of news, views and advice on station upgrades from a somewhat distinguished panel of lawyers, consultants and FCC officials. The law and regulation conference was held at the recent NAB '95 convention.

Larry Eads, chief, Audio Services division, Mass Media Bureau, began the proceeding with a discussion of the tower owner registration and responsibility NPRM issued in January. He cited the fact that there are 12 separate FCC licensees on the average communications tower in the United States. Under this ruling, the tower owner will be solely responsible for tower lighting and marking, instead of each of the individual licensees, as is now the case. Tower lease agreements still will spell out who is responsible for tower maintenance. All tower owners will register their tower in a master database and be given a registration number for easier tracking. The reply and comment period for this NPRM closed on April 20.

LMA impact

Alan Campbell, a communications lawyer with Irwin, Campbell, and Tannenwald, covered the issue of how the new LMA rules affect station upgrade proposals. The FCC enforces these rules based on the city grade coverage contour requirement (5 mV/m for AM and 3.16 mV/m for FM). The main thing to watch here is how the ownership attribution rules are affected by a proposed upgrade where the proposed new contour may create overlap with another commonly owned or LMA station.

The entire group discussed the NPRM proposing unattended operation of transmitters, with the consensus that the time has come for this rule modification, now that modern equipment has proven to be very stable and reliable. The new rule will allow licensees more flexibility in monitoring methods and how station personnel are used. The licensee will still be responsible for legal operation, but operators will no longer need to buy the $45 license. If illegal operation occurs, mandatory shutdown must occur within three minutes. When problems that cannot be remedied quickly do occur, the FCC must be notified. The new rule should be in place by the end of this year.

Joel Levy with the law firm of Cohen and Marks gave an update on the current FCC freeze that affects all current mutually exclusive applications. The now infamous Bechtel case triggered this freeze last August when the courts threw out the original FCC decision regarding the awarding of minority preferences for certain applicants. All current applications for new stations are moving through the FCC processing line unless a competing applicant jumps in with a mutually exclusive application of its own; then the process stops. The FCC still has not acted to modify its position, but Larry Eads predicted a resolution later this summer, hopefully in time to meet the September deadline for competing applications to file on license renewals.

Status of simplification

Susan Crawford, a senior engineer with Denny and Associates (formerly Jules Cohen & Assoc.), reported on the status of the Notice of Inquiry regarding the simplifying of AM directional antenna rules issued back in June 1993. No NPRM has been issued as yet, but again Larry Eads estimated it will be out "shortly" and alluded to seeing a written draft of it recently. With regard to the expanded AM band opening up, Eads promised this issue should be settled "really shortly."

It has been held up by 16 petitions to reconsider being filed, with some of the petitioners apparently claiming the computer program that awarded the initial 74 assignments left them out. Eads pointed out that if the Commission voted to change only one assignment, it would probably scramble the integrity of the entire protection scheme, forcing them to start the process over. Eads predicted that the expanded band will open up by the end of the year, "worst case."

Crawford also discussed the use of the ITS Irregular Terrain Model and its application in gaining a facilities upgrade. This model now be used in areas of rough and irregular terrain where the old coverage contour calculation methods were inaccurate.

M. Scott Johnson, another communications lawyer (Gardner, Carton, & Douglas), summarized the recent streamlining of FM station upgrade applications under the "one-step process." If there are no competing applicants, a station can now file for a facilities improvement via a minor change if the upgrade is within three channels of the present assignment, meets all spacing requirements, and still provides 3.16 mV/m over the city of license.

Terrain shielding can be used in such a showing. Alan Campbell pointed out that if you are contemplating changing city of license, you cannot relocate from a non-urbanized area closer to an urbanized area.

The panel reiterated the need for all stations, and especially LMA operators, to work diligently to comply with all FCC rules. Fines have become substantial, especially for small-market stations who can least afford them. Joel Levy suggested looking at rules compliance as a means of controlling expenses.

Crawford discussed the problems and requirements associated with the FM blanketing rules. Stations need to resolve interference complaints for one year after building new facilities. Some stations not only have been fined, but also have had their program test authorities revoked, forcing them to return to an old transmitter site. She reported that the FCC is serious about this issue and is considering a new NPRM with more enforcement teeth.

The group also considered the problems and abuses stemming from the FM translator service. The rules accept the presumption of need when a single applicant proposes to establish a distant FM service via translator outside the 1 mV/m contour. In these cases the licensee cannot provide the applicant any money or equipment assistance in building the translator. Many ingenious and creative

continued on page 38 ▶

LMAs, Duopolies in Radio

▶ continued from page 34

Schmidt also talked about radio ownership coming up as a topic of discussion in the Senate; several things, including any mention of radio deregulation, were left out of the Senate bill, thanks to last minute compromises. "There is a major effort," he said, "that NAB is spearheading to amend that provision and to get a manager's amendment that would fix a number of the things that were left out of the bill at the last minute. One of them would be a substantial, if not total, deregulation for radio."

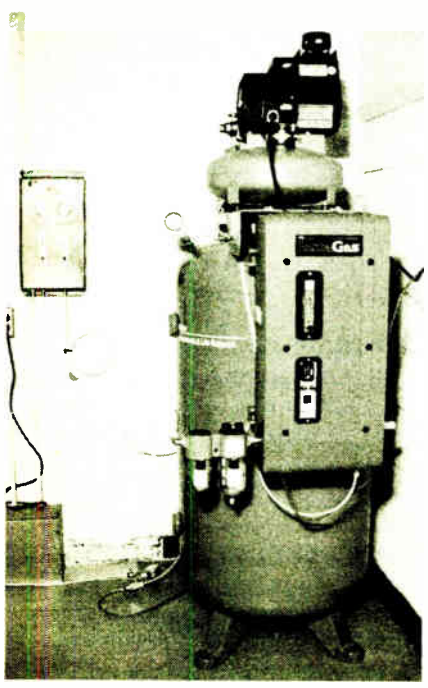
Stewart told the audience that the good thing, "from the broadcasters'" point of view...would be that at both the Commission level and the congressional level, there seems to be bipartisan support for deregulation, particularly in the area of multiple ownership to ensure the viability of free, over-the-air broadcasters.

Radio rules, LMAs

Stewart was asked if the FCC is considering more changes in its radio rules. The answer: not at the present time. He did say, however, that it would be interesting to speculate about whether or not the impact of satellite DAB, and the ability to bring 40 or 50 channels into local communities, would cause some people to think about looking again at the local or national ownership rules to better position broadcasters to be able to compete against the competition.

Asked how the FCC views LMAs, Quale said the Commission treats radio and television LMAs in different ways. For radio, he said, there is a specific limit on time brokerage agreements between stations, with overlapping principal community contours—stations that serve the same market. The rule, he added, says that if a station brokers over 15 percent of the time on another in-market station, the time brokerage arrangement is thought to be an ownership interest for the brokering station, for purposes of the duopoly rule and the national limitation.

The rule does not apply for LMAs or time brokerage arrangement that might exist between stations not serving the same community.



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World Radio History

Mine Your Staff for Potential Stars

by Ken Hawk

CLINTON TOWNSHIP, Mich. We have all heard it before: "There is no talent out there," "We cannot afford quality air talent on a local level," and "Where do we find affordable, quality talent that will make us money?" The laments are countless.

The answers to the foregoing are: "Yes, there is." "Yes, you can." "Right in your own studio."

Talented air personalities, with very few exceptions, are manufactured by skilled programmers. They are not ready-made. In the era when personality radio was the norm, it was a nurturing program director who worked with his personalities and turned out a few big-name stars in the process. This was the kind of program director that gave us John R, Larry Lujack, and Porky Chedwick, just to name a few.

What has happened to that era? Micromanagers, 10-second talk breaks, and program directors with extended duties pushed personality radio by the wayside and made way for the 12-in-a-row music sweep, leaving radio with nothing more than its music to sell itself. An event that gave birth to cookie-cutter format concepts that make radio stations sound alike more and more each day...and we all collectively share the blame.

With a few exceptions, all big-name air talent came out of Hometown, U.S.A., radio stations; small markets with small audiences and literally no local competition.

With a few exceptions, all big-name air talent came out of Hometown, U.S.A., radio stations; small markets with small audiences and literally no local competition. These were places for potential personalities to sharpen their skills, work on developing a style, and then move on to a larger market to do it all over again until they made it to a market that suited their egos and their wallets. This cyclical method of replenishing the talent pool has stopped for the past decade and a half.

More with less

In today's economic climate, radio stations everywhere are doing more work with less personnel. Today's program directors are not only bogged down with their normal routine of selecting music and developing new and existing programming, but additional burdens of thinking up new creative, effective, zero-to-low-cost promotions, caring for public service announcements, news functions and other duties leave him or her literally no time to nurture and cultivate his air talent. Thus air personalities are left to figure out what is to be expected of them through trial and error, with the latter as the usual result.

Compromising this situation further are managers insistent on keeping a hand in the programming department. Though his intentions are good, the program director keeps a closer ear to the ground on how the station should sound. If he is manufacturing the product, let him produce it. If you are not comfortable with the way it is being produced, a one-on-one non-confrontational chat might be in order.

Another problem may be the talent itself. Some jocks have the biggest egos even in the smallest markets. This becomes extremely difficult for a new program director hired from a distant market because jocks who have literally built their careers at the same station may not take kindly to a new broom in the hall closet.

Gently but firmly reassure your staff that the program director is there to help rather than hurt. More than that, affirm that he or she is the person in charge. The program director knows not to fix what is not broken and how to fix what is. If you undermine him in any way, he will not work out.

To correct these problems, try this: Ask your program director how comfortable he or she feels in his position. Is he being overworked? Solicit responses to these matters from him. He might be afraid to communicate these concerns to you out of fear of losing his gig... especially if it is his first as a program director. Take some of those duties off his hands if need be. Does your receptionist want a raise? Have him or her take care of PSAs he might now be doing to offset the cost.

Looking for promotion ideas? Put out the suggestion box. Seriously. You would be surprised at some of your hidden stars among your clerical staff, sales, and part-time jocks.

Promotion essential

Do not continuously prioritize menial tasks over programming. Indeed, promotion is essential in getting your station and its mission out to the public, and FCC paperwork needs to be done. Your product, however, makes your radio station special, and your on-air talent is part of it. The next generation of Howard Sterns, Casey Kasems and Rush Limbaughs are out there. They are just waiting to be discovered. Your program director is the one who can uncover the hidden talents and bring them forth.

If your only reason for going up on the bird is because of a lack of good local talent, take a good look at your existing staff and your program director. Let these people know what you want, give them the freedom to do it, and your program director will see to it that those goals are accomplished. He or she wants to win as much as you because it becomes part of his track record. Work together so you can win together.

□□□

Ken Hawk is an independent programming and economic consultant to the broadcast industry. He may be reached at 810-751-4183.

Advice on Upgrades

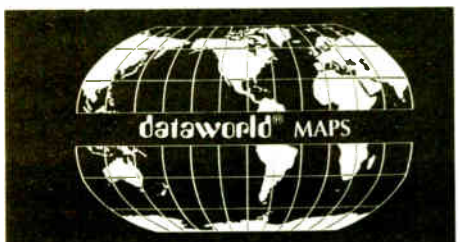
▶ continued from page 37

schemes have been devised by licensees in an effort to skirt this rule and establish their signal as a secondary service. Everyone agreed that FCC enforcement needs to be stepped up in this area.

Finally, the panel revisited the FAA versus the FCC issue, which was spawned in the late 1980s when the FAA began using a much too restrictive model in determining FM thresholds of interference to avionics equipment. Numerous applications were denied or held up for stations at the top end of the FM band. The FAA set up an advisory committee and held a series of monthly meetings with the FCC to resolve the problem. Curiously, even a national airplane pilots association sided with the FCC in arguing that the limits were too restrictive and were based on antiquated avionics designs. Virtually no complaints have been filed in recent years and the monthly meetings have stopped, yet no formal modification of the FAA model has been announced.

□□□

Tom McGinley is chief engineer for WPGC-AM-FM in Morningside, Md. (Washington, D.C.) and technical advisor to RW.



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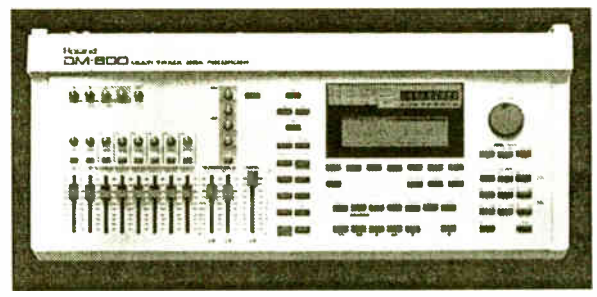

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World Radio History

Push on for Ownership Deregulation

by Lynn Meadows

WASHINGTON Congress is moving closer and closer to the deregulation of the telecommunications industry promised by Sen. Larry Pressler (R-S.D.) when he took over as chairman of the Senate Commerce, Science, and Transportation Committee in January.

Riding the tide of the "no regulation is good regulation" Republican landslide, Pressler promised to remove all restrictions on radio ownership.

Now, with a full House and Senate vote expected soon, Pressler could meet the goal just in time for his July 4 deadline.

Radio restrictions

Initial House and Senate draft bills, while addressing telephone and cable deregulation extensively, did not mention loosening the 20-station-per-band limit that currently restricts group radio station owners.

A spokesman for the House Commerce Committee admitted this was no oversight. "Essentially, the feeling was this was better raised as an amendment. We wanted to have broad bipartisan support for the draft."

That amendment, proposed by Rep. Cliff Stearns (R-Fla.), completely removes all national and per-market radio ownership restrictions.

Under the proposal, the restrictions that limit corporations or individuals to three or four stations per market depending on the size of the market would be removed. The amendment also lifts the national 20 AM/20 FM station ownership limit.

Drafters of the legislation explained that the Justice Department, armed with already existing anti-trust laws, would prevent monopolies from forming just as it does in other industries.

Most members of the National Association of Broadcaster (NAB) Radio Board support group ownership deregulation.

NAB position

NAB President and CEO Edward Fritts praised the efforts of the House deregulation efforts in a bill chiefly proposed by Rep. Tom Bliley (R-Va.) and Rep. Jack Fields (R-Texas).

But Fritts argued for a clause addressing radio ownership deregulation. "We strongly urge that, when the Congress approves this telecommunications reform bill, it includes the critical element of radio ownership deregulation, which is essential to the final product."

Dick Ferguson, president of NewCity Communications and Radio Board vice president, testified in favor of deregulation before the House Commerce Committee.

He pointed out that changes made three years ago in duopoly and national group ownership limits have improved the economies of scale for many radio station owners. "We need to build on that limited success," he said.

Ferguson said that even a group owner who owned 60 AM and 60 FM stations would be "a drop in the bucket" in a nationwide pot of 11,000 stations. He also acknowledged the potential for digital satellite radio, which could broadcast up to 60 stations to every market. "With all this new competition, it no longer makes sense to hold us back."

More volatile than deregulating national ownership limits, however, might be repealing foreign ownership restrictions.

An amendment drafted by Rep. Michael Oxley (R-Ohio) would strike the restriction in the Telecommunications Act of 1934 that prohibits foreign nationals from owning more than 25 percent interest in a given broadcast facility.

The proposal is not without limits, however. According to language in the Senate draft, only citizens of countries who provide "equivalent market opportunities for common carriers to citizens of the United States" would be able to own controlling shares of U.S. broadcast entities.

This "reciprocity" clause would prevent a company like Sony from buying stations in the United States until Japan changed its current trade policy to allow U.S. companies to invest in the broadcast industry over there.

Foreign companies anxious to get a larger share in the U.S. broadcast industry may not have to wait for passage of this legislation.

Shamrock President Bill Clark said that the "situation with FOX may indicate that the commission is willing to take a more relaxed view toward how they enforce that 25 percent" limit.

The FCC ruling on the FOX case came in early May just before hearings began in the House on the telecommunications bill.

After an 18-month investigation, the FCC ruled that 99 percent of the funds to purchase Rupert Murdoch's FOX Broadcasting Co. technically came from Murdoch's Australian-based company. The commission ruled 5-0, however, that even though the equity source was foreign, it would not revoke television licenses if FOX could prove it served the public interest.

Industry analysts fretted that this might set a precedent for foreign companies to hedge into the broadcast market. But a spokesman for the FCC said, "Anybody could have done this in the last 10 years, and they can now." He said the law considers the 25 percent a benchmark, which the FCC can override if it feels the public interest would be served.

Administration officials testified against the foreign ownership legislation proposal at hearings in March citing concerns about national security.

Proponents of the bill see it as a way to open overseas markets to U.S. broadcast related industries.

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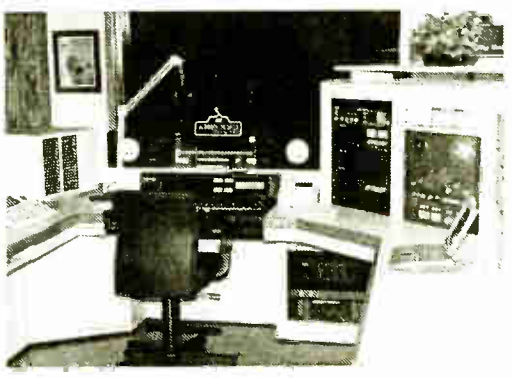

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World Radio History

ABC, NPR Audio Available on Demand

Integration of Computers and Radio Continues As Distributors Begin to Make Product Available Via E-Mail

by T. Carter Ross

WASHINGTON Beyond the computer-based automation and editing systems on display at NAB, one new development announced at the NAB spring show is certain to further integrate computers and radio.

The Seattle-based software company Progressive Networks (PN) announced at the Las Vegas show the launch of RealAudio, a series of software packages that allow sounds to be played back from the World Wide Web (WWW) without download delays or any special equipment.

National Public Radio (NPR) and ABC Radio have joined with PN, making available programming for the audio-on-demand system.

Real time programming

With RealAudio, anyone with a standard multimedia computer, Internet access and a Web browser can access and listen to a variety of programming in real time.

Hourly news reports and "Peter Jennings' Journal" commentaries from ABC Radio are currently available in the .RA file format through the PN home page (http://www.realaudio.com/), as are segments from NPR's "Morning Edition," "All Things Considered" and "Weekend Edition."

Also available are audio clips from Radio Yesteryear, such as reports from 1937 of the Hindenburg explosion.

Links on the PN home page connect users to other sites using .RA on the Web, including the WWW sites of international broadcasters Radio Canada and Deutsche Welle.

Joining with RealAudio allows ABC Radio and NPR to expose millions of Internet users worldwide to their programming, which in turn can expand awareness of their program offerings.

For broadcasters wishing to add .RA files to their home pages, PN offers RealAudio Studio and RealAudio Server. These programs allow stations to make available audio samples of the station, or even an entire on-line radio station.

To listen to .RA files, all that is needed is RealAudio Player, which is available in a Windows beta-test version from the PN home page.

RealAudio Player uses a PC's soundcard driver to play back 8-bit, 8 kHz sound. Audio quality is comparable to AM radio, which the company attributes to the limitations of transmitting sound via a 14.4 baud modem. There are plans to upgrade sound quality in future releases. The transfer rate for RealAudio is approximately 1 kbps.

Different requirements

Conventional audio storage formats used on the WWW, such as .AU or .WAV files, require a user to download a file to a local hard drive or server and then play back the file—a process that can last five to 10 times longer than the actual sound clip.

RealAudio Player is being incorporated into several Web browser software packages, including Netscape. Microsoft also intends to include RealAudio Player in future Internet-related products.

Production versions of RealAudio Player for Windows and RealAudio Server for Windows NT and UNIX will be available by mid-year. RealAudio Player for Macintosh and RealAudio Studio will be available in the third quarter of 1995. Beta-test versions of all three programs for Windows are available from the PN home page, with Macintosh-, UNIX- and OS/2-compatible versions to available by summer.

To run the Windows version of RealAudio Player, a basic multimedia 486 PC with 8MB of RAM and 2MB of free disk space is required.

Information from PN is available via the World Wide Web at http://www.realaudio.com/ or via e-mail at info@real-audio.com.

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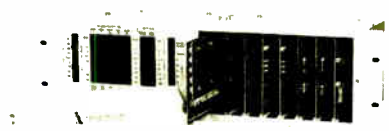

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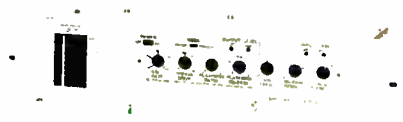

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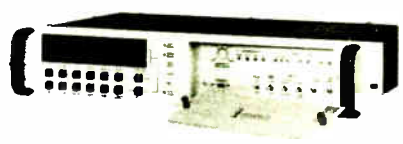

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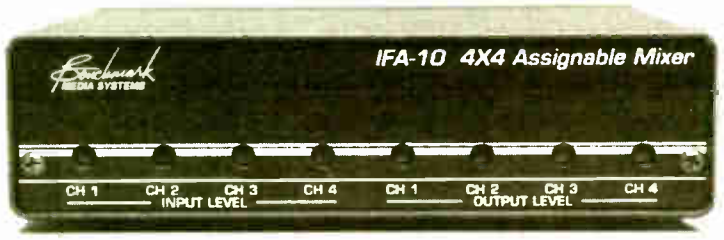
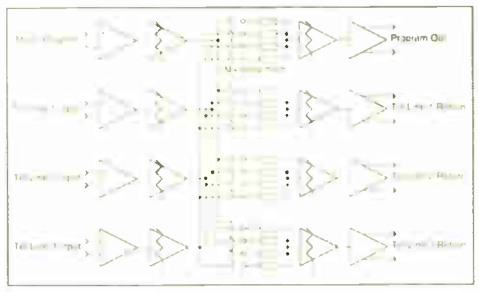
Mix-Minus with Ease



The IFA-10 4x4 mixer is the perfect device for creating any simple mix-minus. Use it as a mono input to your console or down stream and get a mix-minus for three telco lines, or use it down stream from a stereo console and conference two lines. Need more lines? Combine two or more units. At $300, power supply included, it's priced right. Now you can get that talkshow on the air without having to buy a high priced, fancy-dancy console. Call Rory Rall today for details.



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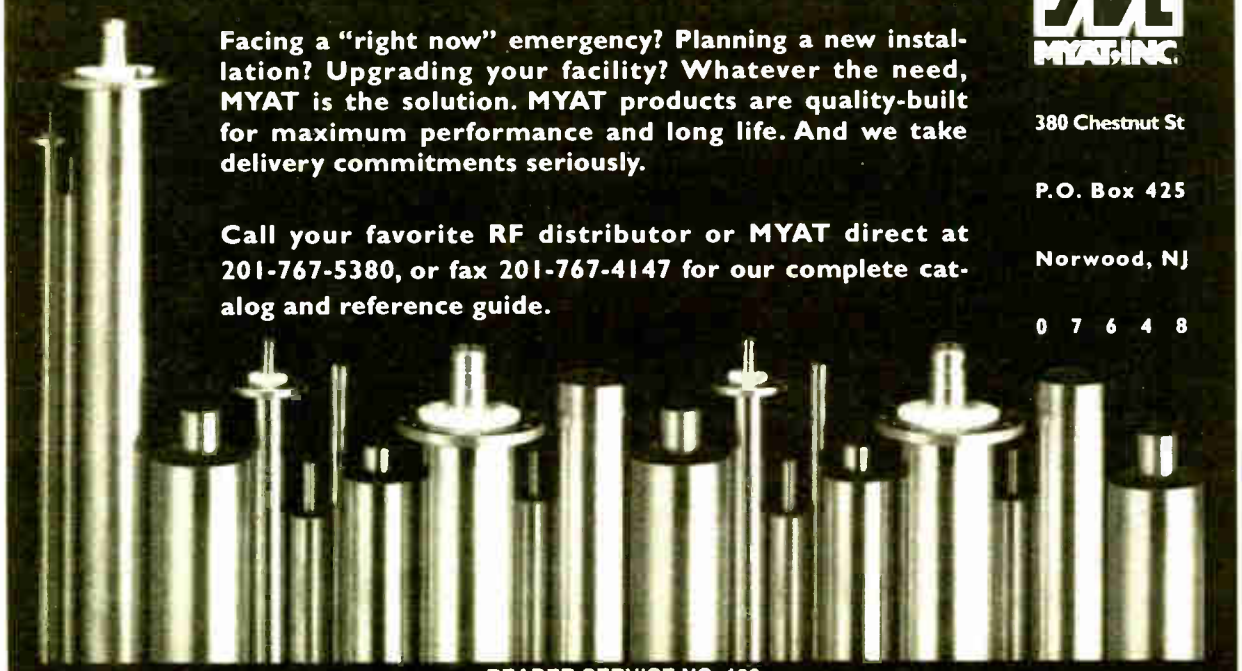

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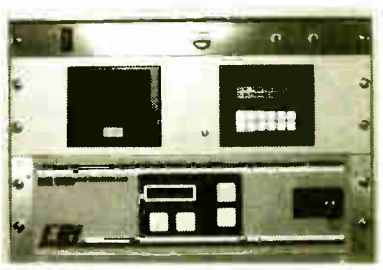

ARS-1003 - Automatic Transmitter Recycler
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World Radio History

RDS Paves Way for Digital Radio

Editor's note: In the second part of this wide-ranging interview with Dietmar Kopitz, the "Father of RDS" assesses its future in digital audio radio.

RW: *Where do you think RDS will be in two years?*

K: Everybody will have (RDS). You cannot reverse technology that is accepted, established and available at extremely low prices. The integrated circuits cost only a few dollars, and they are printed in millions of copies. The companies who are making this technology know what they are doing, so there is nothing to be developed anymore.

RW: *Some people seem to think that when high speed gets here, RDS will simply go away.*

K: I don't think so. The most attractive feature of high speed is that it can be used for services that generate additional income to radio stations. If the technology can be developed—it is being attempted by some organizations and companies—it would be a very good thing. But it does not do any harm to RDS and the idea of a smarter FM radio.

High speed does not do any harm to RDS and the idea of a smarter radio.

RW: *Even in a digital future?*

K: Actually, the people who do radio look very much into the digital future now. We are very concerned about implementing DAB. And in DAB, we also have a data channel that will be of a high capacity. That will permit us to implement any data service we can imagine now.

RW: *At what point do the broadcasting and consumer electronics industries look at the RDS situation and say, "This is how many radio stations need to be online with RDS. This is how many manufacturers need to be online with product?" In other words, what is the benchmark that has to be reached before RDS can be considered a true success by the industries involved with it?*

K: One way to solve this kind of a problem is to have all the different partners (and) industries work very closely together. We began to realize this a number of years ago in the EBU, and so created an association called the RDS Forum. We have 150 organizations that are now members.

All sectors of the industry are represented—the receiver manufacturers, the encoder manufacturers, the service providers, those who run transmitter networks, and those who are interested in some commercial data services to be operated, the paging service providers, for example, the differential GPS service providers and the broadcasters. We meet twice a year. The membership is worldwide, with many members from the United States. Members are not necessarily individual broadcasters, but people who represent groups of broadcasters, like National Public Radio.

The NAB is a member, as is the EIA. What we try to do is identify where problems come up in using the RDS system, and also, determine what the new requirements are for using the system so we can harmonize the standardization process. We tried to build a consensus, and we tried to remove operational difficulties. We issue guidelines for using the RDS system. By so doing, we assure that all sectors of the industry collaborate. Thus we achieve very, very good results. In the RDS world, we are very lucky in that there are no big problems.

RW: *You mention the European RDS Forum. They just met, at the Mobile Electronics Show, to form a United States version of that.*

K: But we should not talk about a European RDS Forum—I mean, the initiative was taken within the EBU... but it is actually a worldwide forum. We look at the success for this technology all over the world, and we promote it also in our newsletters for the whole world.

I think they do not look at harmonizing the standard, because this is being left to the NRSC standardization group, (which) looks after (the) upgrading of RDS. We in the EBU do not have specialized RDS working groups of the broadcasters any longer. We say this (is) an advantage, because it is very, very important that all the sectors of the industries involved now work closely together, and the upgrading of the standard, we think, is only a sort of a rubber stamping process. We've achieved consensus of what we want to do. This consensus building was done in the RDS Forum, and we (are) in consensus nowadays on a worldwide basis. The way we work together with the United States is absolutely marvelous.

□□□

Information on the RDS Forum can be found on the World Wide Web. The URL is http://pchf1-131e.unil.ch/~uer/rdsh000.htm.

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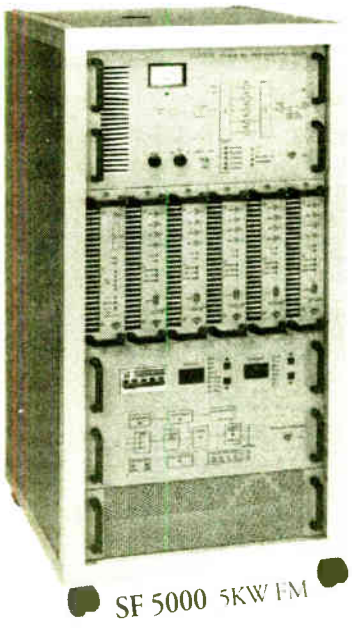

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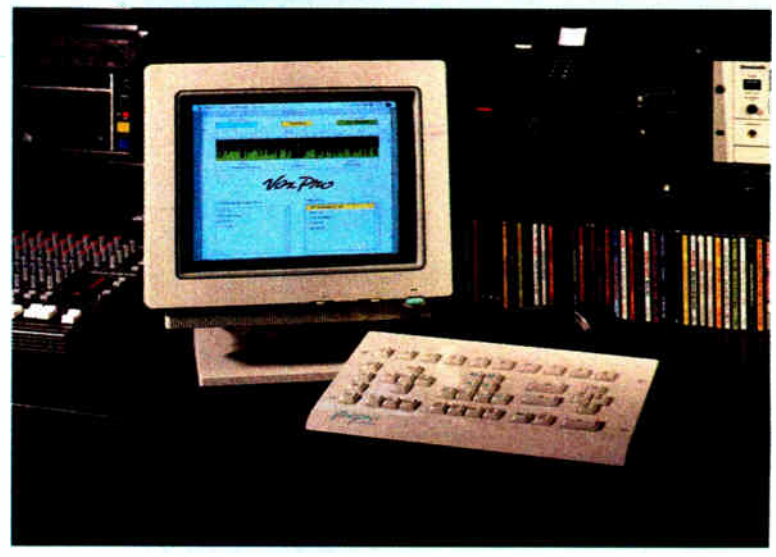

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World Radio History

Lesson in Theory of Electronic Circuitry

First in a series

by Harold Hallikainen

SAN LUIS OBISPO, Calif. This is the first article in a new series where I will discuss the theory behind electronic circuitry. The ideas presented are based on 14 years of teaching electronics at the community college level. I hope to include your ideas and perspectives, so please call or write!

The circuit analysis will generally be based on algebra and trigonometry. The circuits will also be analyzed using MicroSim's PSpice software.

Getting PSpice

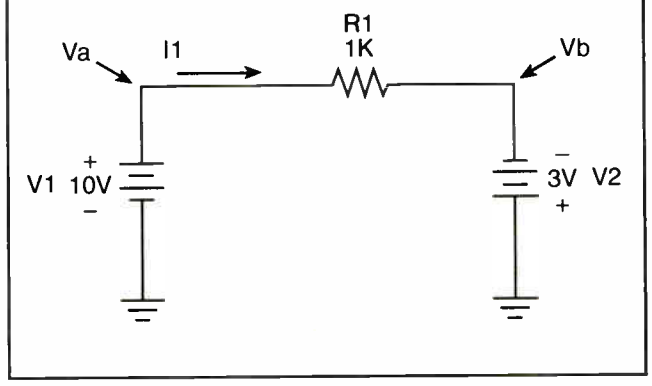
An evaluation version of PSpice is available at no charge from various sources. For those on the Internet World Wide Web, you can find it at <http://slonet.org/~hhallika/>. PSpice is listed in "Harold's Bookmarks."

For those without Internet access, PSpice is available for downloading on the H&F BBS at 805-541-0201. On most modems, you can work through our voice/fax/data menu by telling your modem to dial "1-805-541-0201-@5"; the @5 will use DTMF to select item 5 (the BBS) from the voice menu after five seconds of silence. On the BBS, select "mailbox 0."

Both sources have PSpice versions for DOS, Windows and Mac. If the BBS does not answer, try again in a couple minutes. It shuts itself down after an hour of inactivity.

Voltages are measured between two points. You can measure a voltage across a component, but not the voltage through a component. If one of the two points between which you are measuring the voltage is "ground" (a reference often, but not always, connected to earth), you are measuring the "voltage with respect to ground." You will often hear of the voltage "at a point." The voltage "at a point" is the voltage between that point and ground. Specifying a voltage to ground at a point is a very concise method of indicating how a circuit operates. Further, these voltages are easy to measure, because you do not have to keep moving the reference probe (as you do for voltages across components) or interrupt the circuit (as you do to get a current measurement).

Figure 1.



To determine the voltage at any point in a circuit, start at some point where you do know the voltage with respect to ground, then wind your way through the circuit, taking whatever path you wish, adding in the voltage rises and subtracting the voltage drops. I like to show voltages across components using the notation shown in Figure 1. The magnitude of the voltage is placed between a plus and minus sign showing the polarity of the voltage. By keeping careful track of polarities, you always come up with a valid solution.

In Figure 1, a plus sign is placed near the lead leaving the positive side of each battery and a minus sign is placed near the lead leaving the negative side of each battery.

To determine Va (the voltage at that point with respect to ground), start at ground (0 V) and go up 10 V to get to the point you are interested in. In this instance, you "went up" in voltage because you are going in the negative side of the battery and coming out the positive; you are coming out "more positive" than you went in. So, Va is +10 V.

To determine Vb, you can also start at ground, but this time you "go down" 3 V, because you are coming out the negative end of the battery. This makes Vb = -3 V.

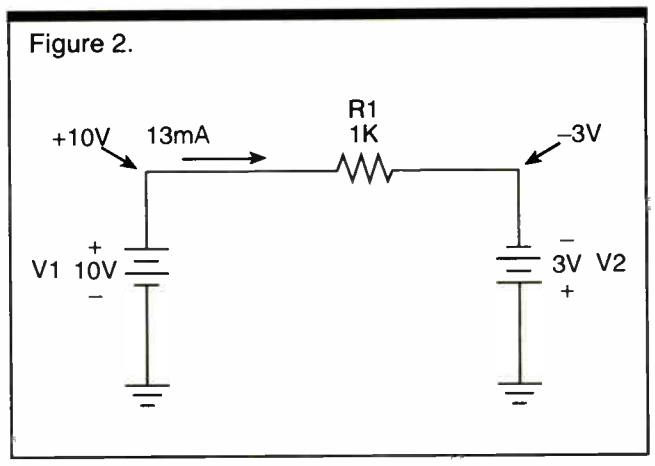
The voltage at point A with respect to point B (Vab) is Va-Vb. This voltage would be measured with the red lead of the voltmeter on point A and the black (reference) lead on point B. In Figure 1, Vab = 10 - (-3) V = +13 V. Vba = (-3) - 10 V, which would be -13 V. This is equivalent to reversing the leads on the voltmeter. So, do you say the voltage across the resistor is +13 V or -13 V? It all depends!

This ambiguity leads us to use voltages with respect to ground whenever possible. Again, it is a concise notation with no ambiguity.

In this series, I will use "conventional current," that "flows" from positive to negative. Although electric current in metals is due to the flow of negatively charged electrons, flowing from negative to positive, current direction has historically been indicated as being from positive to negative. Engineers generally use conventional current; technicians often use electron current. This certainly does not help communication.

An advantage to conventional current is that you can use a plumbing analogy. Fluids flow from high pressure to low pressure, or from positive pressure to less positive pressure, or from positive pressure to negative pressure. You can easily visualize the direction of current flow from the plumbing analogy.

Figure 2.



Ohm's Law

Most readers already know that Ohm's Law states that I = V/R where I is the current in amps, V is the voltage in volts and R is the resistance in ohms. Looking at Figure 1, you see that R = 1K (kilohm or thousand ohms). But what is the voltage to use in the equation? Is it 10 V? 3 V? -3 V? 13 V? -13 V? Because of this confusion, I have redefined Ohm's Law (and I'm not the first!) to be the following:

$$I = \frac{Vtail - Vtip}{R}$$

To use this formula, draw an arrow in the direction you think the current is going, or in a convenient direction. The direction of the arrow does not matter—you will still get an accurate answer.

Vtail is the voltage at the "tail end" of the component (according to the current arrow). Vtip is the voltage at the tip end. I1 in Figure 1 becomes

$$\frac{10V - (-3V)}{1K} = 13\ mA$$

What if you drew the current arrow the other way? This is shown in Figure 3.

Figure 3.

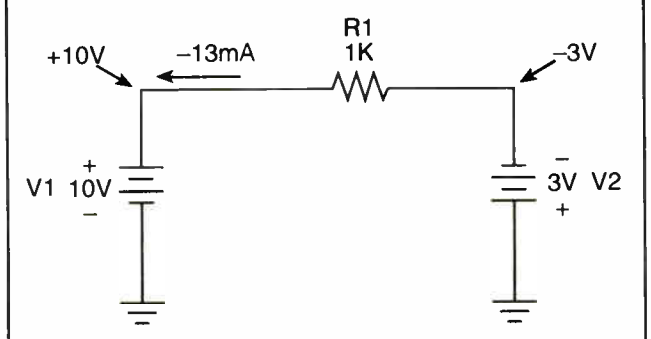


Figure 4.

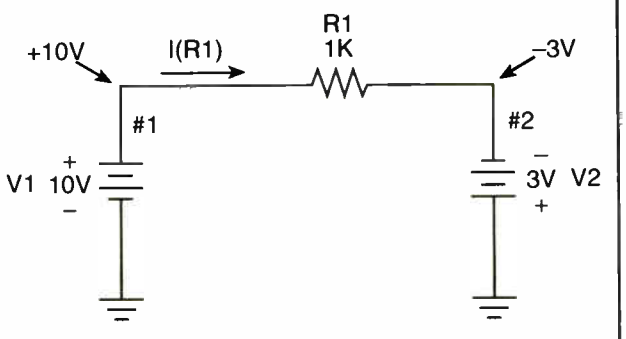


Figure 5.

```
V1  1   0   DC  10volts      ;  Left DC voltge source
V2  2   0   DC  -3volts      ;  Right DC voltage source
R1  1   2   1K               ;  The resistor

.dc V1  10volts  10volts     1volt; Sweep V1 from 10 volts to 10 volts in 1; volt steps

.print dc   v(1)  v(2)  v(1,2)  v(2,1)  v(r1)  i(r1)
;                                          +-------- Current through R1
;                                          +---------Voltage across R1
;                                    +-----------------Voltage at node 2;
;                                                      with respect to node 1
;                              +-----------------------Voltage at node 1;
;                                                      with respect to node 2
;                        +-------------------------------Voltage at node 2
;                  +-------------------------------------Voltage at node 1
```

Figure 6.

```
V1  1   0   DC  10volts      ;  Left DC voltge source
V2  2   0   DC  -3volts      ;  Right DC voltage source
R1  1   2   1K               ;  The resistor

.dc V1  10volts  10volts     1volt; Sweep V1 from 10 volts to 10 volts in 1; volt steps

.print dc   v(1)  v(2)  v(1,2)  v(2,1)  v(r1)  i(r1)
;                                          +-------- Current through R1
;                                          +---------Voltage across R1
;                                    +-----------------Voltage at node 2;
;                                                      with respect to node 1
;                              +-----------------------Voltage at node 1;
;                                                      with respect to node 2
;                        +-------------------------------Voltage at node 2
;                  +-------------------------------------Voltage at node 1
```

V1	V(1)	V(2)	V(1,2)	V(2,1)	V(r1)	I(r1)
1.000E+01	1.000E+01	-3.000E+00	1.300E+01	-1.300E+01	1.300E+01	1.300E-02

World Radio History

Here, the current becomes

$$\frac{-3V - 10V}{1K} = -13\ mA$$

13 mA "to the right" is equivalent to -13 mA "to the left." Often when you find that the current is negative, you will change the arrow direction and rewrite the current as positive. Other times, it's more clear to just leave the current negative.

Table 2. PSpice metric prefixes

PSpice PREFIX	Metric Prefix	Equivalent Exponential Notation
f	femto	1e-15
p	pico	1e-12
n	nano	1e-9
m	milli	1e-3
K	kilo	1e+3
MEG	mega	1e+6
G	giga	1e+9
T	tera	1e+12
mil	*	25.4e-6

*mil is used where a length in meters is expected. A mil is equivalent tc 1/1000 inch.

Figure 4 shows the circuit redrawn with PSpice node numbers. A node is where two or more component leads are connected. In CAD systems, a node is often called a "net." CAD systems then generate "netlists" from the schematics and use these in board layout. Note that PSpice defines node zero as ground.

Figure 5 shows a PSpice listing for this circuit. The first line is the title and is not evaluated by PSpice. If you start the circuit description on line 1, the first line will not be evaluated.

A line beginning with an asterisk (*) is a comment, and the line is ignored. If a line contains a semicolon (;), everything after the semicolon is ignored. Because the semicolon is a more flexible comment delimiter (it may be in any column), I use it exclusively. I suggest extensive commenting. Also, blank lines are ignored, so you can use spacing to make the listing more understandable.

The circuit description includes a list of the components, which nodes those components connect to and any characteristics of the component. We'll introduce various components through this series.

Voltage sources are identified by V followed by an alphanumeric identifier (with no separating space). Valid voltage source designators include V1, V+, Vcc, Vee.

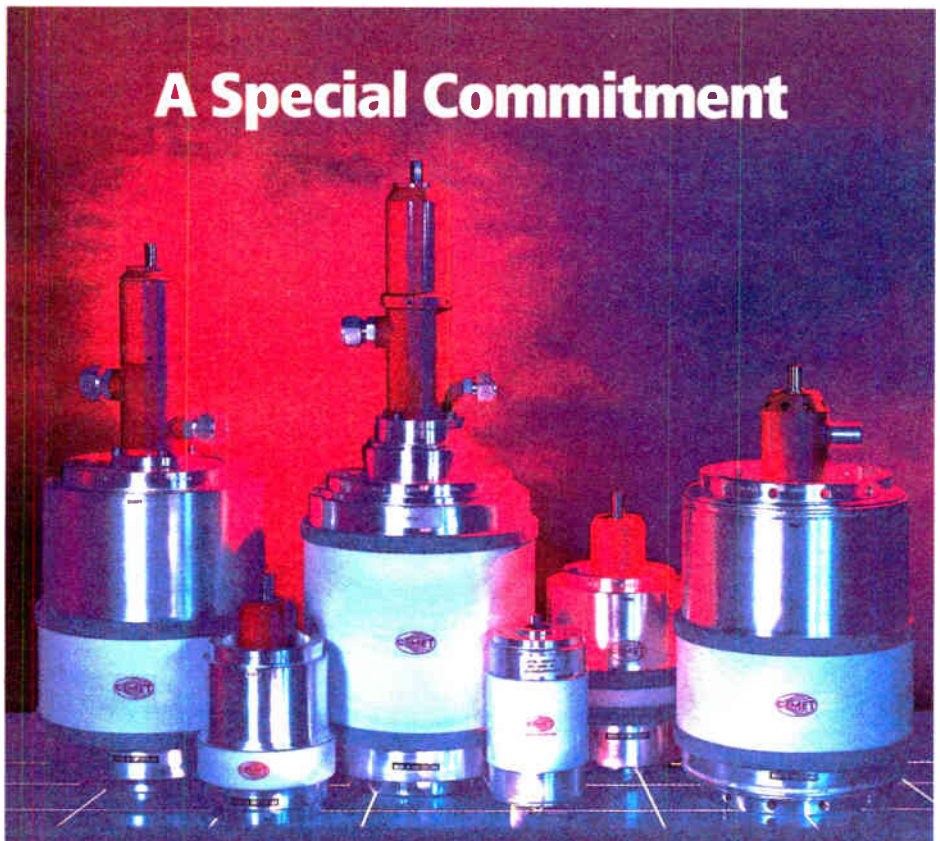
The voltage source designator is followed by the two nodes to which the voltage source is connected. Nodes may also be identified by alphanumeric strings, though I generally use numbers. The first node is the "positive" terminal.

The nodes are followed by DC indicating this is a DC source and will be used in the DC analysis of the circuit. The DC is actually optional, but I like to include it because it makes the format consistent with that used in AC and transient analysis (which we'll deal with later).

Finally, the voltage source lists the voltage in volts. The word "volts" is optional. I include it for clarity. Note that there is no space between the number and the word "volts." Placing a space here will give an error message.

As mentioned above, the first node listed for a DC voltage source is the "positive" terminal, yet you find in Figure 4 that the negative terminal of V2 is listed first. When specifying ground referenced voltage sources (which occur a lot), I list node 0 (ground) second so that the voltage indicates what the output voltage is with respect to ground. For

continued on page 46 ▶



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Lesson in Theory of Electronic Circuitry

▶ continued from page 45

example, in our listing, it is very clear that V1 is a +10 V source, and V2 is a -3 V source. The resistor similarly lists the component "instance" (R1) followed by the two nodes the resistor is connected to, followed by its resistance in ohms. Note that PSpice recognizes metric prefixes but is case insensitive. This creates a problem for milli and mega, because both start with "m." Table 2 lists the metric prefixes PSpice allows. It also allows the use of exponential notation. The 1K could also be shown as "1e3."

The "dot dc" tells PSpice how to do the DC analysis of the circuit. It usually does a DC sweep, varying a voltage source from one voltage to another with a specified step size. Because you are not really interested in a voltage sweep, you can fool PSpice with the given .dc statement.

The "dot print" tells PSpice what to put in the output file. The .print is followed by "dc" indicating this print is for the DC analysis (the only one we're doing right now). It then lists the various parameters we want printed. The comments show the form at various voltages and currents.

Note I(R1). Will it be positive or negative? PSpice shows currents based on conventional current going into the first node listed for the component. In this case, node 1 was listed first, so referring to the schematic in Figure 4, the current will be +13 mA. If the nodes had been reversed on R1, the current would be listed as -13 mA.

The last line of this PSpice listing is ".end." PSpice allows multiple circuits to be analyzed in one run. In that case, each circuit would be in the same file with a ".end" at the end of each. The circuit file needs a ".end" even if it's the last thing in the file.

The input file (circuit1.cir) is run through PSpice, which generates circuit1.out, shown in Figure 6. The output includes a copy of the input text followed by the requested information (from the .print statement). Unfortunately, PSPice .print output is in "scientific" notation instead of "engineering" notation where the exponent is an integer power of three, making conversions to metric units easy. With a little decimal point sliding, however, you find that the PSpice output is what we expect. Note especially the voltage and current polarities.

More to come

Next month I'll continue some DC circuit analysis and look at the schematic capture capabilities of the Windows version of PSpice. I'll look forward to your comments.

□□□

Harold Hallikainen is president of Hallikainen & Friends, a manufacturer of transmitter control and telemetry equipment. He also teaches electronics at Cuesta College. He can be reached at 805-541-0200 (voice), 805-541-0201 (fax), and, on the Internet, hhallika@slonet.org and http://slonet.org/~hhallika/.

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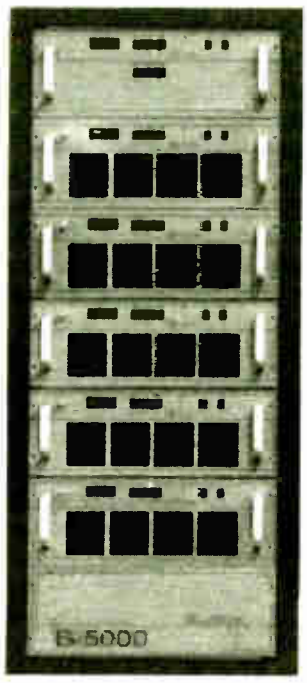

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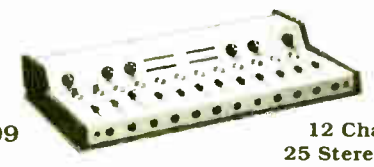

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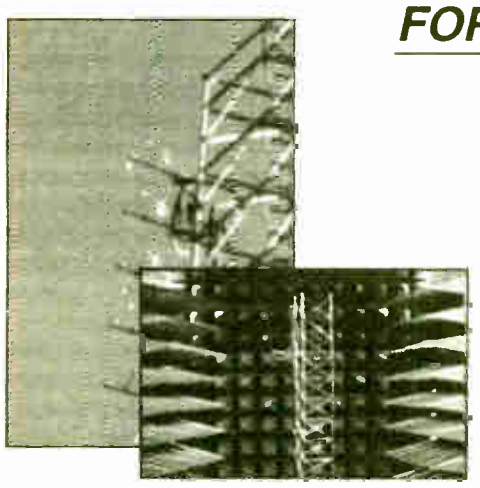

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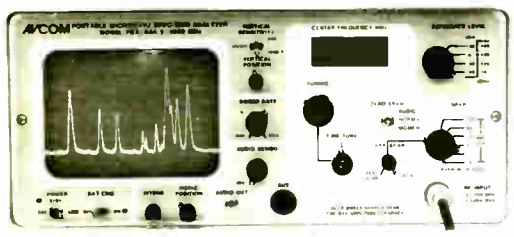

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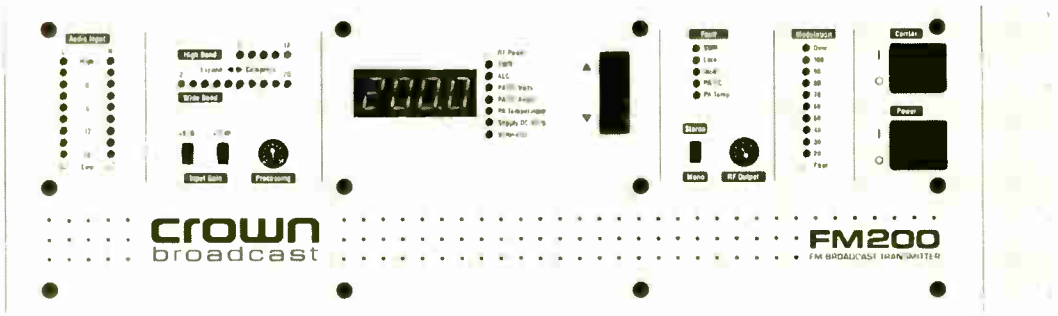

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School Facility Embraces Digital World

Broadcasting Tradition at Technical School Continues With Upgraded, Leading-Edge Radio Facility

by Marc Kellom

MILWAUKEE The Milwaukee School of Engineering (MSOE) has been involved in broadcasting since 1922, when it put Milwaukee's first radio station, WIAO(AM), on the air. Engineering students from this small private college have kept MSOE on the air ever since.

A view of the rack that holds "support" gear

In 1981, MSOE alumnus Everett Cobb donated $30,000 to the school, money that was used to start WMSE-FM. The station went on the air in 1981, and since that time, there has been talk of boosting its power. Finally, in early 1993, WMSE-FM applied for permission to increase ERP from 1 kW to 3.2 kW. A construction permit was granted by the commission and in November 1994 the station began planning in earnest for the long-awaited WMSE "Power Crank '95."

It was very important for us to uphold the university's tradition of excellence in technical education.

An alumnus of the college myself, I prepared to direct the project with the help of the student engineering staff at the station. We faced several problems from the onset.

The university wanted the boost to occur by the station's 14th anniversary on March 17 of this year. This created a bit of a time crunch, because equipment orders were not placed until mid-December. Thus planning for the project had to be completed in only a few weeks. A new transmitter would be required to provide the additional power.

It was very important for us to uphold the university's tradition of excellence in technical education. That meant that every piece of equipment and every connection had to represent cutting-edge technology. Audio quality also had to represent the best available, in order to meet the demands of our listeners and programming.

Other factors also were considered, not the least of which was my role as coordinator of the project from my "day job" at Crown International in Indiana.

A new transmitter

Choosing a new transmitter posed an interesting set of questions. WMSE is run by an all-volunteer staff, most of whom are engineering students with limited time to contribute. Accordingly, we needed something that would require little maintenance. This concern, combined with the need to be on the "cutting edge," pretty much dictated a solid state transmitter.

Another major benefit was the prospect of "hot pluggable" power modules—being able to stay on the air at reduced power while servicing a module was very enticing. We evaluated transmitters from several manufacturers, and settled on a Harris Platinum series PT2FM.

When time came to choose an exciter, there was little discussion—we all wanted a Harris Digit. WMSE's diverse mix of programming includes jazz, blues, New Age, classical, alternative rock, Hip-Hop and just about anything else. This wide range of music, combined with the critical ears of our rather fanatical listeners, dictated the absolute highest audio quality. Clearly, Digit was the way to go.

When you hire a mover, hire someone who is used to moving unusual objects.

The only problem we faced was how to get AES3 format digital audio from studio to transmitter.

The WMSE studios are located on the ground floor of an MSOE residence hall. The transmitter is on the roof of another residence hall across the street. We are fortunate to have a "hard wire" STL consisting of six twisted-pair cables that run 825 feet between studio and transmitter. We could easily envision sending audio or even composite FM through this cable, but the 6 MHz bandwidth of an AES3 digital signal was another story.

We briefly considered using fiber optic cable, but installation costs were prohibitive and we just did not need

continued on page 50 ▶

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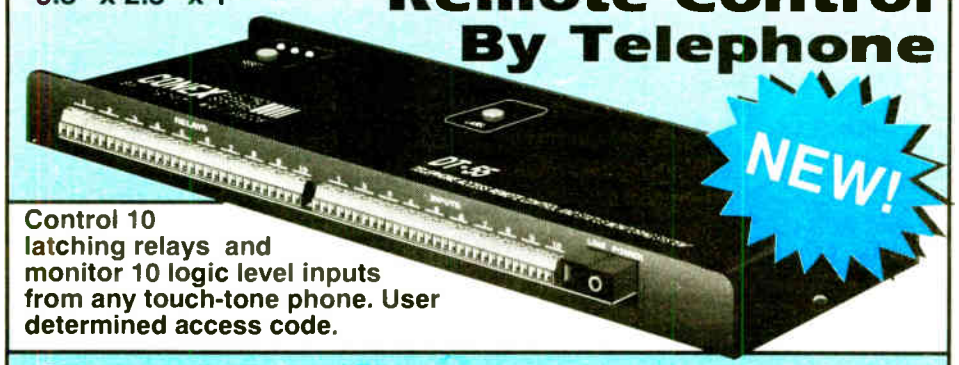

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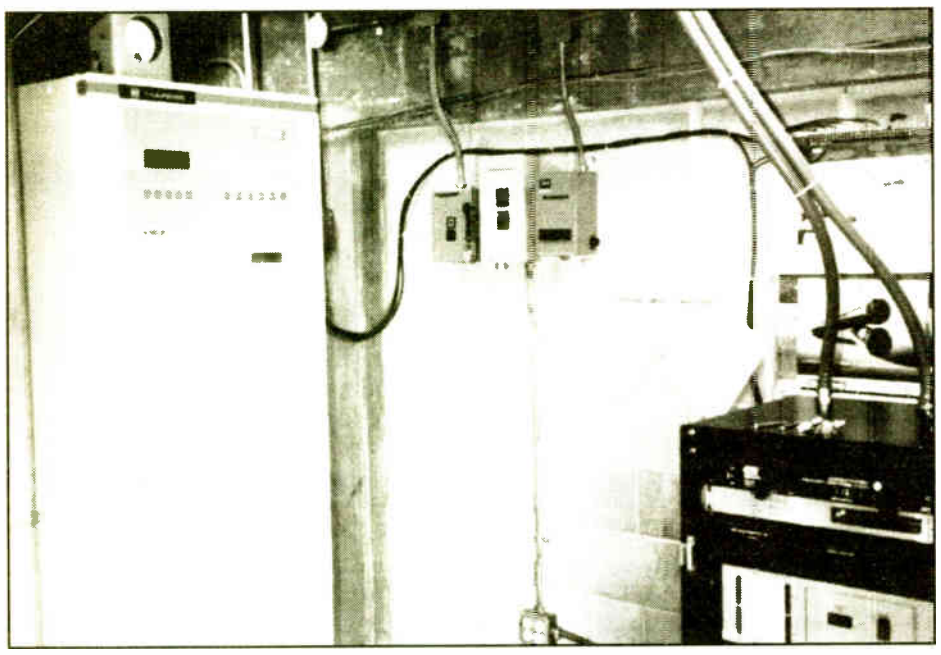
World Radio History

WMSE Facility Improved

▶ continued from page 49

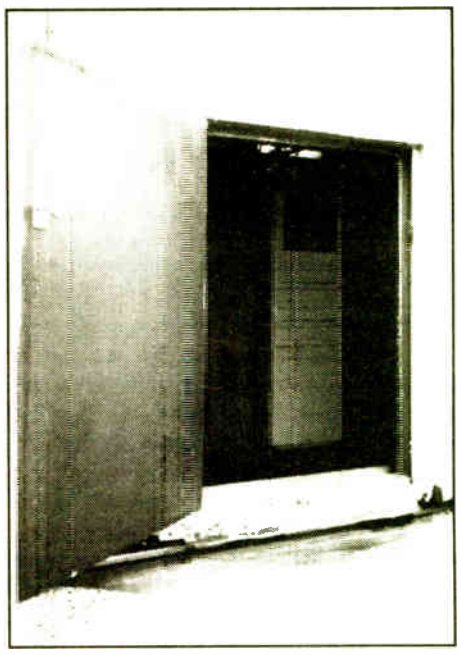
that kind of bandwidth. After doing some research, I came across a draft AES document (AES-3ID-xxxx) titled "Transmission of AES3 formatted data by unbalanced coaxial cable."

Based on the information in the document, I was able to design a simple STL using coaxial video cable. Custom wound pulse transformers were used on either end to provide an impedance match between AES3 (110Ω) and the 75Ω video cable. The transformers were mounted in two rack-mount project boxes, with XLR connectors for the AES3 data and BNCs for the 75Ω connections.



WMSE's transmitter and rack

Our digital source signal was obtained by installing a digital I/O card and firmware upgrade in our Optimod 8200. We had our electrician run Belden 8281 video cable from studio to transmitter, hooked everything up and took a DAT machine with an AES3 input to the transmitter room. Everything worked on the first try, and I breathed a tremendous sigh of relief. WMSE now had a fully digital path from audio processor to exciter!



The Harris Platinum PT2FM had to "squeeze" through a 1/2-height door to reach its new home.

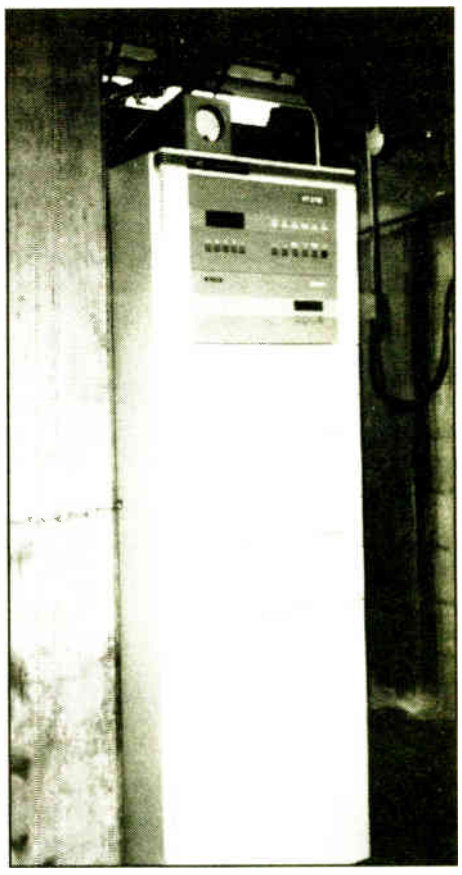
Installation of the transmitter was quite simple. Less than three hours after the transmitter arrived at our loading dock, we were on-air. All of the excitement surrounding "delivery day" generated a fair number of spectators, most of whom brought cameras. Don Taylor and Tom Harle of Harris Allied delivered the transmitter in person, and I can only guess what they must have thought when they saw the army of photographers present.

The most difficult part of the installation was getting the transmitter to the roof of the residence hall on which our tower is located. Elevator service was available up to the 12th floor, but from there we had to negotiate a flight of stairs, a big step out onto the roof, and a half-height door into the transmitter room. A local moving contractor was brought in and moved the power supply, transmitter cabinet, and power modules to the roof separately.

We learned a valuable lesson here: when you hire a mover, hire someone who is used to moving unusual objects. Show them the site and the proposed path for the transmitter. Someone used to moving vending machines is a particularly good choice, because vending machines are similar to transmitters: big, fragile, and most of the weight is in the bottom.

In keeping with the "cutting-edge" philosophy, WMSE invested in several other new technologies as a part of this project. An RE533 RDS encoder was purchased from RE America and is used to broadcast radiotext messages about WMSE and the university. In order to provide maximum flexibility in the use of our Optimod 8200, we purchased 8200PC remote control software. Combined with a phone line and modem, we now have control of our processing from any remote site.

The results of this project have been most gratifying. Previously, tuning in WMSE required a steady hand and a great deal of patience. The station now jumps right off the dial, even on small clock radios.



The Harris Platinum PT2FM in the elevator penthouse of a WMSE residence hall

Dozens of listeners have called, stating that for the first time, they can receive our signal inside office buildings or at their suburban homes. Audio quality has improved quite a bit, especially in fringe reception areas. The outer fringe of our signal has been substantially increased, and most of metro Milwaukee now has a signal strong enough to permit full quieting in stereo. For this simple college radio station, it is a dream come true.

□□□

Marc Kellom is design engineer in the audio division of Crown International in Elkhart, Ind., and an alumnus of MSOE. He worked at WMSE as a student, and now volunteers his engineering skills to students on staff at the station. He can be reached at 219-294-8022.

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World Radio History

Have Some Fun with Station Band Names

FROM THE TRENCHES

by Alan Peterson

Dear Luci,

Ever since I authored that four-parter on MIDI back in 1993, I've been receiving tapes from stations who've cooked up some very funny and creative parody songs and music routines. Nothing pleases me more than folks who glom onto something new and become brilliant at it. Although, if I could make a small suggestion....

With all the creativity that goes into the effort, why ruin it by crediting the song to an uninspired group name like "The (call letters) Singers"? Or with the station slogan such as "The MIX Masters" or "The 96Q-Cumbers"?

I have nothing against promoting station slogans and calls as much as possible, but truly creative people shouldn't stop at the first idea they pick. I think it is more credible (and promotable) to give credit to a "manufactured" band that gives "record service" to only that station. If the idea stiffs, then the "band" gets the blame and the show is spared the trauma. But if the song actually catches on, nobody else in the market can have it! Best of all, a few pickup musicians can be hired to actually create such a group for one night if needed to open for a headliner brought into town... that's how the Grass Roots did it 25 years ago.

"But all the good names are taken," one may say. Think so? The acceptance of Alternative music has given rise to some wonderfully weird and picturesque group names. To invent one for a station band is as easy as:

Going to the supermarket. Just look at those great signs hanging over each aisle, describing the contents. Every one a potential new Alternative band name: Candy Popcorn Diapers. Dried Banana Meat. Lipton Pyrex. Frozen Feminine Auto.

Read the racing column in the Sports section. I have always thought there is just one guy in an office somewhere in Hollis, N.Y., who's in charge of naming all the Rap Groups and racehorses in the whole world. See if you can tell, Luci: Quick Z, Aak Aak Aak, R. Monica, Cool Blast, Budd Fudd and Frosty Star. Hot new Hip-Hop acts playing on CHR?

Nope. That's the racing lineup at Penn National for Dec. 23, 1994.

Read a foreign phonebook. Most libraries have these on microfiche, and they are a rich source of inspiration. Why should Wang Chung have all the fun in this department? Warning: phonebooks for most Asian countries have hundreds of subscribers whose names are pronounced the same way as *THE BIG ONE*, so a little caution is advised. No sense getting everyone in trouble.

The Fine Arts teamed up with a disgusting object. Always a winner. Pick any famous name and tack on something horrible. DaVinci's Shorts. Whistler's Mothball. Toscanini Roadkill. Robert Frost's Pregnant Cousin. This one is so easy it should be disqualified.

Choose a name similar to the original artist. For some of my own creations, I've mangled Rick Astley into "Rick Parsley," Ace of Base became "Mace in Face," Willie Nelson suffered into "Willie Makeit?" and yes, I did the same thing everybody else did for Weird Al Yankovic (call me if you don't know). Finally, by picking elements from many names, "Klaus Von Sputum and His Beautiful Music Orchestra" was born, playing horrible pop-string arrangements of contemporary songs.

Finally, in desperation, make a bad anagram. Yeah, this is the cheap way out, but may be the tiebreaker when the morning show can't decide on a name to use. They're especially worthwhile when you cheat a little and add or ignore letters. Overlooking one or two, my own name anagrams out to "Stan On Parole," "Tear No Panels" or (lucky me) "Stern Anal Rope." Blow off unnecessary letters and syndicated hosts Don And Mike get regurgitated as "Dead Monk," or (by swapping an "S" for one of the "Ds") "Eskimo D.N.A." Any one of these could be a legit name for a band.

If it's worth doing creatively, it's worth having every angle covered right down to a slick name. Stations using comedy service music or creating take-off songs with MIDI may want to consider these suggestions. It's a lot fresher than another crutch-use of the slogan, which to my ear is being done to death already.

So I leave you Luci...time for my group to open for Sting. Talk to you in June.

— Al

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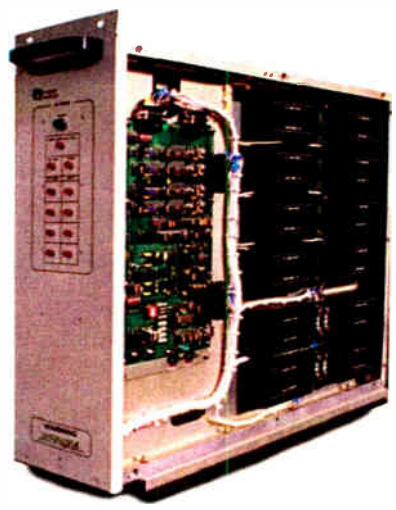

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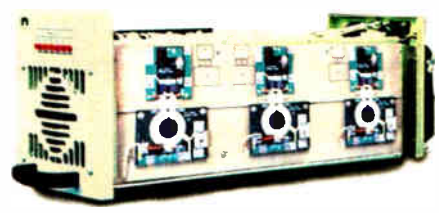

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World Radio History

Route Audio with Versatile, Reliable Relay

Performance, Reliability and Ruggedness Are Among the Many Virtues of the Simple Relay

by Jim Somich

MORGANTOWN, W. Va. As I've mentioned before, the modern radio station probably switches as much as—if not more than—it mixes. This applies not only to control room functions, but also the various switching and routing sequencers, intelligent switchers or matrix systems. But if you look around the station, behind the racks and under the consoles, you will find dozens of relay boxes or aluminum brackets housing the circuits that perform special switching tasks, not the least of which is the routing of audio. These requirements at transmitter and remote sites. From power change to remote satellite crystal switching, from audio line selectors to satellite polarity switching, these systems are a vital part of today's broadcast station.

Figure 1.

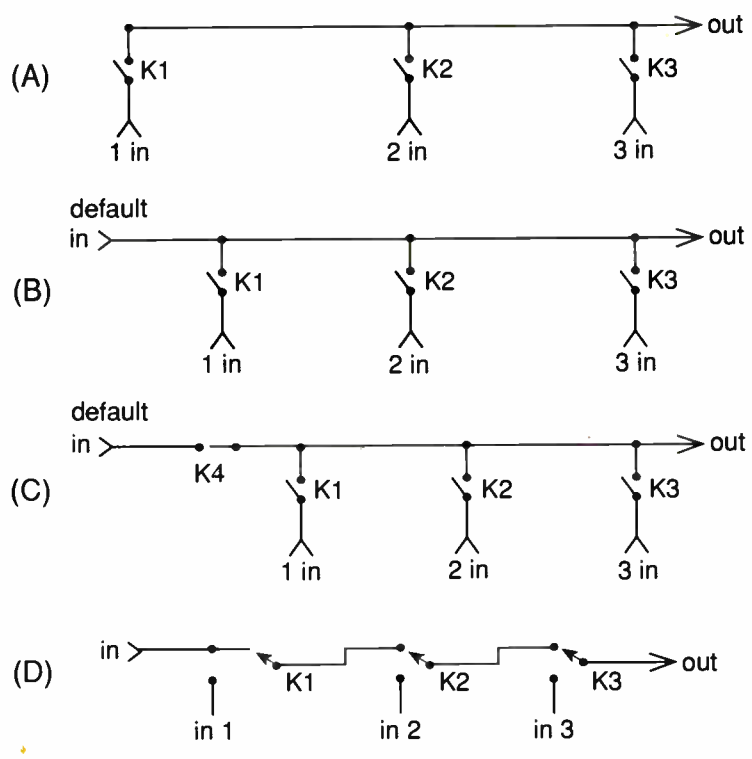


Figure 2.

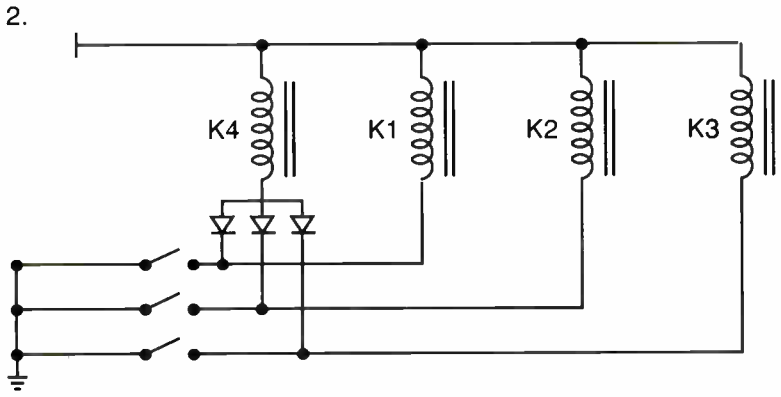
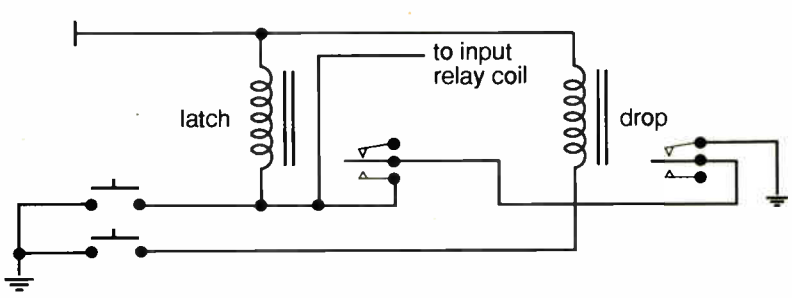


Figure 3a.



Some of our switching requirements are complex, time-based, or computer-driven, usually requiring professional-grade equipment with fancy names like elaborate differential and well-regulated power supplies. Moreover, if the chip parameters are not controlled properly, analog switches will introduce distortion and/or clipping. In the end, it is hard to surpass the performance, reliability and ruggedness of the simple relay.

Audio routing using relays is common, and can be accomplished several ways. Some basic flow diagrams are shown in Figure 1. In 1(a), the inputs are switched into a common output line. The circuit is simple, and requires only single-throw relays. The only drawback here is that one of the relays most likely would be used as a common source, and would be energized most of the time. Furthermore, it would need to be released before another source was selected.

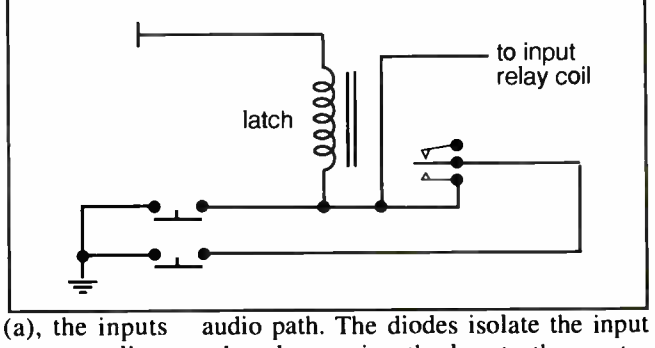
Default input

One solution to this, as shown in 1(b), is to establish a separate default input. The circuit as shown has a problem inasmuch as all inputs are placed in parallel with the default, so a mix of both default and selected source would be heard at the output. The addition of a fourth relay, shown as master relay K4 in Figure 1(c), will remove the default audio when any input relay is energized.

If the proper relays are available, the circuit in 1(d) handles both jobs, i.e., interrupting the default path when selecting a source. Note, however, that the upstream relay controls the default audio flow, and would require the necessary wiring scheme to provide control to other source locations. These relays, too, for stereo, would need to have four form C contact arrangements.

Figure 2 illustrates the wiring scheme for the circuit in 1(c), which solves the aforementioned problem. When any input relay line is pulled low, the master relay energizes, breaking the default audio path. The diodes isolate the input relays by passing the low to the master but preventing the low from energizing another input relay coil.

Figure 3b.



The scheme shown in Figure 2 uses a maintained-type switch, sometimes listed as push-on, push-off. For this type of operation, you need only to pull the bottom end of the desired coil to ground, hold it there, then release it. This method, however, is limited, because it is not compatible with most switching protocols.

Better method

A better method, utilizing latching circuits, is shown in Figure 3. Alas, we need two more relays, though they require only one set of contacts each. We energize the latch relay with a momentary closure, the relay holds itself through the NC contacts of the drop relay until another momentary switch closure activates it. Other advantages of this method are that economical SPST momentary switches can be used, and the latch and drop can be performed easily from multiple locations. A less desired method in 3(b) uses a normally closed switch in place of the drop relay. For multiple location operation, it must be looped through each remote switch before returning to the source. Not a good concept, for if the line becomes open, none of the relays will operate.

Figure 3c.

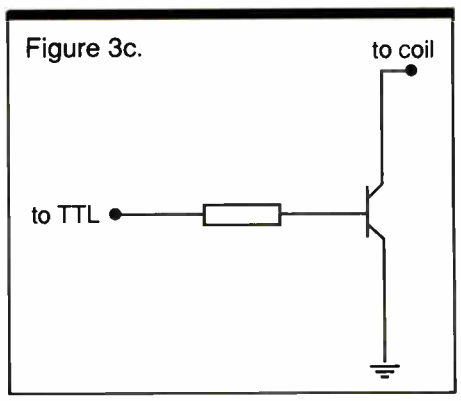
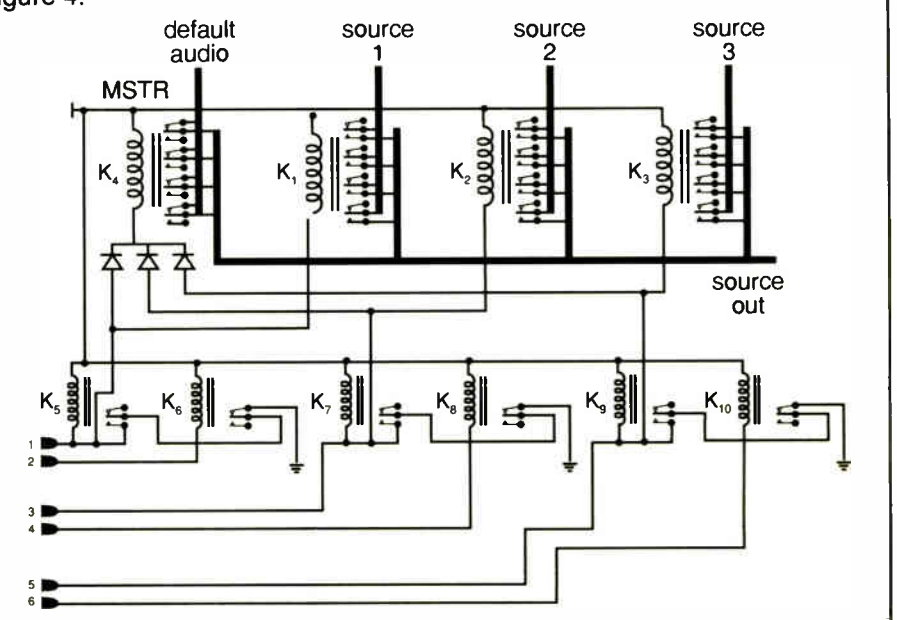


Figure 4.



Some of our switching requirements are complex, time-based, or computer-driven, usually requiring professional-grade equipment with fancy names like log switches on the market, it is hard to beat the versatile relay. Even though it has a higher unit price, the cost usually evens out because relays do not require audio requirements come along frequently, so you might find yourself in a dilemma as to whether to use solid state switching, or go with the old-fashioned relay.

While there are many solid-state ana-

World Radio History

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Tascam ES-50/51 sync, TC gen +2 slaves, cables/manual, barely used, syncs multitrk to video, $1500/BO. D Michaels, Big Tree Comm, Mt Shasta CA, 916-938-2833.

Technics SH-9010 stereo paragraphic EQ, rack mount, 2-channel, 5 bands/channel, adjustable freq/bandwidth each band, +/- 12 dB/band, unbal in/out, $225/ BO+shpg. E Helvey, 461 Layside Dr, Winchester VA 22602. 703-877-2717.

Wegener 1601 satellite receiver, including cards 1605-12, 1683-8, 1606-21, 1645, 1646, 1624, $750; Optimod 8100D, hot card including, $3500; Orban 424-A studio processor, $395; Crown-D 150A amplifier, $300. T Hodgins, KCKY Lucky 98, 14 E Main #4, Walla Walla WA 99362. 509-529-6242.

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UREI 1122 SS stereo xscription preamp. $75. R Sumner, CAVU, 44632 Guilford Dr, Ashburn VA 22011. 703-450-2288.

ADC 1/4" patchbays and cords. NEW, UNDER HALF PRICE, ADC TT patchbays, $129 up, NEW cords, $9.95. W Gunn, POB 2902, Palm Springs CA 92263. 619-320-0728.

Bulk eraser, $49; Stewart 4 ch D-box, $95; Cue command decoder, $125; NEW Tascam midilizer MTS1000, $450; Infonics 7" reel copier 1-3 copies, 2@ $125 ea; Furman elec crossovers, $95; Peavey M2600 power amp, $375; Crest FA800 PWR AMP, $475. W Gunn, POB 2902, Palm Springs CA 92263. 619-320-0728.

Good used studio tape 1/2" $15, 1" $30, 2" $55. W Gunn, POB 2902, Palm Springs CA 92263. 619-320-0728.

Want To Buy

Ampex tube mixers, plug-in mic preamp modules for PR10's, Altec or other tube compressors, Mackie mixers. W Gunn, POB 2902, Palm Springs CA 92263. 619-320-0728.

AUTOMATION EQUIPMENT

Want To Sell

FS-12C to ITC 48 tray Instacart interface w/cables, 19" rk mt, xlnt cond, BO; IGM 48 tray/mono Instacart, operating but w/3 bad trays, could be repaired easily using parts from machine, BO; IGM 48 tray/mono Instacart, parts only, BO. M Watson, WSCZ, POB 1247, Greenwood SC 29648. 803-223-8553.

Sentry Systems FS-12C Format Sentry w/cables, connectors, etc, xlnt cond, BO. M Watson, WSCZ, POB 1247, Greenwood SC 29648. 803-223-8553.

Valley 400 mic processors w/phantom pwr, BO. Scott, DS Communications, 5859 Shanymist, #3, Cincinnati OH 45239. 513-385-0130.

Harris 9002 Instacart, 5 ITC 750s, 3 sngl plys, floppy disc backup, incl ample AC music library on 90+, no monthly fees, BO. John D, 314-471-1520.

Harris 9000. G Collins, WDOC, Univ Dr, Prestonburg KY 41653. 606-886-8409.

Otari ARS 1000 automation decks (4) w/Conex 25 Hz tone decoders, also 2 72" racks w/doors, $3500/BO. Bdct Media Ctr, 213-466-2900.

Sono Mag 350 Carousel, $500; Sono Mag 352-RS (2), $500/ea; Sono Mag 352, $500; Sono Mag 250, $500. G Collins, WDOC, Univ Dr, Prestonburg KY 41653. 606-886-8409.

Systemation Quicksat, 10 hrs mono storage, 2 color monitors, 2 keyboards, HD, $7500. S Poese, KBRX, POB 150, O'Neill NE 68763-0150. 402-336-1612.

Want To Buy

04B J05A ABC Netcue II automation cntrlr that is programmed for ABC News, Rush Limbaugh, ESPN radio or can be re-programmed for above svcs. R Mahaffey, KTTR/KZNN, Box 727, Rolla MO 95401. 417-883-9180.

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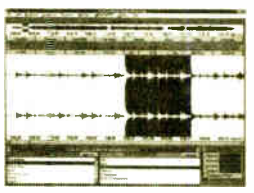

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BE cart machines, 2 series 2100C stereo playback, 1 mono Spotmaster 2100 PB, 1 mono Spotmaster 2100 play/record, $150/ea mono, $300/ea stereo. S Poese, KBRX, POB 150, O'Neill NE 68763-0150. 402-336-1612.

ITC Encore, serial 258, ply, $425; ITC Encore 256, ply, $425. G Collins, WDOC, Univ Dr, Prestonburg KY 41653. 606-886-8409.

RCA/BE RT 120 stereo record (1), stereo PB (1), recently rebuilt; extra parts machine, spare parts, all manuals; Audiopak AA4s new & used; all for $800/BO. B Gibson, WNCB, 2828 Piedmont Ave, Duluth MN 55811. 218-722-3017.

SMC Series 710 single play cart machines (2), dual tone for automation systs, have all ICs, cards & electronics & good heads, both have damaged frames from freight shpmnt, one for parts or both, $100/ea/BO. B Williams, 918-455-9522.

Spotmaster TP1B cart winder with timer, $50. L Fuss, WDTL, POB 1438, Cleveland MS 38732. 601-846-0927.

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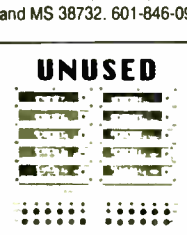
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Tapecaster X-701 (2), mono PB, good condition, very clean, with manuals, $295/ea; Beaucart 12-123 stereo record, stereo PB, good condition, very clean, w/manual, $295. K Lamson, 510-447-7405.

Tapecaster X100 RP VGC, $495. A D Ishkanian, Focus on Truth, 132 Arbor Oak Dr, Ashland VA 23005. 804-752-6942.

BE triple deck, $600.00. G Perry, 915-550-0558.

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

ITC System 99B stereo record/play: tones, ELSA, auto head: $1200/firm. C Scott, WKYU-FM, (502) 745-5489.

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Otari MX5050 4 track with rolling floor mount, excellent condition, low hours on heats, 4 year old, Best Offer. Scott, DS Communications, 5859 Shanymist #3, Cincinnati OH 45239. 513-385-0130.

Ampex/Schiffer AG440 2-trk R-R repros, 7 1/2/15ips, good condition, $100/ea. D Bailey, Rock Shoppe Prod, 3422 Beech St, Rowlett TX 75088. 214-475-9796.

ITC 1/2-trk stereo R-R repros (8), all operating, BO. M Watson, WSCZ, POB 1247, Greenwood SC 29648. 803-223-8553.

Revox PR-99 R-R PB (4) w/25 Hz, xlnt cond, $500/ea or $1500/all. J Arzuaga, WQQZ-FM, POB 980, Quebradillas PR 00678. 809-895-2725.

Tascam TSR-8 analog 8-trk deck, new w/remote locator & manual, $1800/BO. R Shepard, Xanthi Music Inc, 300 Observer Hwy, Hoboken NJ 07030. 201-659-3339.

Ampex 350 r/p deck, $250; Ampex 350 pb deck, $200; Inovonics 355 r/p electronics, $250; Inovonics 376 pb electronics, $150; Inovonics 905 pwr sply, $75; Scully 280 4-trk R/P, $750. D Thompson, 510-609-8631.

Ampex AG-350 deck with 2-track R/P heads, Inovonics 3 speed elect, 3 speed reversible Beau motor, mounted in AG-440 console, $600/BO+shpg; VSC C-4 Soundpacer cassette recorder with variable speech control play @ higher speed & retain original pitch, AC/DC, can feed R-R deck through for edit R-R tapes @ high speed, EC, $50+shpg. E Helvey, 461 Layside Dr, Winchester VA 22602. 703-877-2717.

ITC 856-7532 play only, $650; Revox PR-99, PB, $650; Scully Type 270, $650; Scully Type 270-2 (2), $650/ea; ITC 856-7532, PB, $195. G Collins, WDOC, Univ Dr, Prestonburg KY 41653. 606-886-8409.

MCI JH110 1" 8-trk, 7 1/2, 15, 30 ips, compl rebuilt, 70% life on heads, in roll-around console, $2700. W Whitney, Whitney Creative, POB 2411, Overland MO 63114. 314-428-8430.

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Scully 280B 1 4-track, 2 stereo, 1 full track, xlnt cond, 1 2-track for parts, $500/BO/all. J Danis, The Audio Dept Inc, 119 W 57th St, NY NY 10019. 212-586-3503.

Sony TC-152SD stereo cassette deck with VU meters, 2 speeds, BO; Casio DA-2 port DAT record/play deck, battery or AC, almost new, in box, BO; Wollensak Model 2851 cassette recorder/playback, heavy duty, BO; ITC Encore R/P mono cart recorder/player, S/N 434, BO; Dukane Model 28A18 recorder/pulsers (2), 50Hz @ 0.45/2.0 seconds, BO. D Jackson, 203-762-9425.

Teac Tascam 80-8, 8-channel 1/2" R-R, BO; Ampex 351 R-R, vintage, BO; Ampex 1091 stereo recorders (2), BO; Wollensak 2770 cassette duper, stereo unidirectional, BO; Pentagon 1100 Series 4-channel cassette duper, BO; Crown 800 Series stereo R-R, 10", looks vintage, BO; Nakamichi Model 100 Type II 3-head cassette console, wooden case, BO; Teac 3340-S 4-channel simul-sync stereo R-R, 1/4"x10", BO. D Jackson, 203-762-9425.

Teac A 3300 SX 1/4-track stereo deck, 3 heads, excellent condition, no head wear, $400+shipping. S Lawson, KAK Productions, 920 Hyland Dr, Santa Rosa CA 95404-2230. 707-528-4055.

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Otari Mark II-IV 1/2" 4-track, multi-track, mint, less than 50 hours, Best Offer. R Kaufman, Pams Productions, POB 462247, Garland TX 75046. 214-271-7625, after 3PM CDT.

Otari 5050-SHD 8 trk 1/2" newly rebuilt, heads have full, life left, $1800. W Gunn 619-320-0728.

Scully '100' recorders, record/play amplifiers, 8, 16, 24 track heads. Sequoia Electronics, 4646 Houndshaven Way, San Jose CA 95111. 408-363-1646.

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Ampex ATR100 taperecorders for parts. Circuit cards, heads, motors, machine parts, or electronic parts. Call 818-907-5161.

CD PLAYERS

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Pioneer 18-disk (5), $175 ea. L Fuss, WDTL, POB 1438, Cleveland MS 38732. 601-846-0927.

Sony CDK-006 Jukebox (3), 2 refurbished, $1395; 1 in service, $995. J Helper, WQLV, 234 Uniton St, Millersburg PA 17061. 717-362-1099.

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Auditronics 110B w/pwr sply & patch bays, good cond, $500/BO. J Danis, The Audio Dept Inc, 119 W 57th St, NY NY 10019. 212-586-3503.

Collins 6, $200; Collins Gateway II, mint w/manuals, $650; Collins 830F, 1-3 Phase plate transformers, completely rewound, $700. G Collins, WDOC, Univ Dr, Prestonburg KY 41653. 606-886-8409.

Micro Trak Sport II, $150; Maxi Tel 4-chnl, $100. S Poese, KBRX, POB 150, O'Neill NE 68763-0150. 402-336-1612.

Ramsa 820 20x8x16 w/meter bridge, $1795; Quantum 23x16x24 as used by LA Philharmonic, $3750. W Gunn, POB 2902, Palm Springs CA 92263. 619-320-0728.

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Harris Gatsway-80 cntrl board. H Thompson, WWIC, 815 W Willow, Scottsboro AL 35768. 205-259-1050.

Pacific Rcdrs ABX or AMX consoles available in next six months, prefer good cond, but will rebuild. S Gray, WWKL, 3605 Vartan Way, Harrisburg PA 17110. 717-541-9515.

Stereo consoles 6,8,10,12 or 18 slide pot pref. Scott Communications, POB 10262, Amarillo TX 79116. 806-356-6916.

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Aphex Dominator 723C with pre emphasis de emphasis, BO; Aphex Compellor, excellent condition, used 6 months, BO. Scott, DS Communications, 5859 Shany-mist #3, Cincinnati OH 45239. 513-385-0130.

Roland SRV 2000, $525; **dbx 503** expander/comp, $290; Shure SM-57, $70; UA 565-filter set, BO. T Coffman, Rolltop Music, POB 17203, San Diego CA 92177. 619-571-5031.

Shure M610 feedback cntrlr, $100; Teac 1/2" calibration tape, $30; Roland Boss RV1000 digital reverb, $140; Ampex 456 7" reels, $5/ea. D Kolher, Digital Sound, 1919 Hanover Ave, Allentown PA 18103. 610-776-1455.

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Want To Buy

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CRL Systems SPP-800 stereo prep proc, $800/BO; AM Matrix SMP-900 proc, $800/BO. J Kesler, POB 644, Livinston KY 40445. 606-843-9999.

Want To Buy

FM Optimod w/XT or compl audio proc syst w/stereo gen; Tascam 32 R-R or equiv; audio dist amps; mic audio proc unit. R Coleman, 309-944-4633.

Instruction manual or Schematic for RCA BA-146 limiter amp. J Graham, POB 242, Sandy Springs SC 29677. 803-242-1005.

Langevin Progar limiter, RCA BA-6, BA-86 limiters, Universal Audio 610, 1008, 1016, 508, 509, etc. M Linett, 818-244-1909.

Orban Optimod 9100. Robert, 904-477-6688.

Fairchild 670 or 660 tube compressor/limiter Teletronics LA-2A tube compressor/limiter or UREI LA-3A solid state compressor/limiter, call after 3PM CST. 214-271-7625.

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Sony ECM377 large dia. cond mic, $495; RCA 77DX w/new ribbon, Crown GLM200 lavalier like new, $125. W Gunn, POB 2902, Palm Springs CA 92263. 619-320-0728.

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RCA 77DXs/44BXs ribbon, chrome/TV grey, gd cond, BO. R Kaufman, Pams Prods, POB 462247, Garland TX 75046. 214-271-7625, after 3PM CDT.

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30 kW Delco gen, Detroit diesel, xfer panel, new batts, HD continuous run, xlnt cond, 1200 hrs, from Ameritech, $6500. J Phillips, 419-782-8591.

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Switchcraft patch bay. $50. D Thompson, 510-609-8631.

Huey & Phillips lighting syst; 1mm code beacon type F, one lighting cntrl box. 1 load balance syst, 2 sets side lights; $800 + s&h. We do maintenance, too. Nat'l Painting Company, 913-232-5544.

Want To Buy

UTC input bridging xmfrs such as A-18, A-19, HA-104, AH-106, LS-19, LS-21, LS-40, any sngl piece of above. RQ Studio, Larson RD #4, N Reading MA 01864-1071. FAX 508-668-8973.

Jazz record collections, 10" LP/12" LP be-bop, swing, dixie, highest prices paid. B Rose, Program Recdgs, 228 East 10th, NYNY 10003. 212-674-3060.

MONITORS

Want To Sell

McMartin TBM 4500A FM mod monitor, needs some work, pwr splys & electronics, $500 D Thompson, 510-609-8631.

McMartin TBM 1005D FM rebroadcast receiver, new, for rebroadcasting, simulcasting, translators or monitoring of RF, modulation, or injection. **ALSO:** (used) AM/FM modulation monitors, Buy or Sell, Repair & Calibrate McMartin, Belar. Call **Goodrich Ent Inc.**, 11435 Manderson St., Omaha, NE 68164. **402-493-1886** fax **402-493-6821**

QEI 691/02 mod monitor analyzer w/67 kHz, 92 kHz, $4000. D Wilson, KBMY, 919 S 17th St, Bismarck ND 58504. 701-223-1700.

RECEIVERS & TRANSCEIVERS

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GE MVP 25 w UHF front mount on base xceiver, preamp, PL accessories 1 on 4 chnl, $50. P Russell, Boudoin College, Sills Hall, Brunswick ME 04011. 207-725-3066.

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Moseley 505C transmitters & receivers, all operating with manuals, $1000/Best Offer; TFT 8301 (2) composite 8301 receivers, $1000/Best Offer. D Matyis, KVET/KASE, 517-495-1300.

Studer auto hybrid, 2-line phone interface with manual, $595. R Sumner, CAVU, 44632 Guilford Dr, Ashburn VA 22011. 703-450-2288.

Burk TC-8 remote cntrl, xlnt cond, $1495. B Laird, WDUZ/WQLH, Box 310, Green Bay WI 54305-0310. 414-468-4100.

Giant radio boom box trailer w/4 kW gen, BO. D Matyis, KVET/KASE, 517-495-1300.

Marti remote p/u xmtr w/antenna; FM xmtr xciter; Sine or Burk dial-up remote cntrl syst. R Coleman, 309-944-4633.

Burk TC-8 remote w/IP-8 interface relay panel, set up for wire, will go radio, $1000/BO. Steve, Westline Bdct, 310-547-9546.

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Gentner Digital Hybrid 1 phone interface, like new cond, $495. B Laird, WDUZ/WQLH, Box 310, Green Bay WI 54305-0310. 414-468-4100.

Harris Sentinel 16 remote cntrl, xmter & studio chassis, config for dedicated lines, as is w/spare parts, BO. Neil S, WXYT, 810-569-8000.

Marti RPT 30, as new, $1300. R Shaw, 221 E Linden St, Caldwell ID 83605. 208-459-4614.

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Gentner SPH3A phone interface. R Coleman, 309-944-4633.

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World Radio History

SATELLITE EQUIPMENT...WTS

Sedat card for Scientific Atlanta receiver, $750. D Jackson, 203-762-9425.

Wegener Comm 1601 frame w/SMN classic rock cards, compl syst, $1000. B Geyer, WRVC, Huntington WV, 304-523-8401

Want To Buy

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Circle (214) On Reader Service Card

STATIONS

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Full Time clear channel 50 kW daytime-reduced power nights AM in capital city. 501-470-1525 nights.

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Want To Sell

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Various tapes, 1" (2), unopened hubs, (3) used reels, 1/2" (1) unopened reel, $20/ea. D Bailey, Rock Shoppe Prod, 3422 Beech St, Rowlett TX 75088. 214-475-9796.

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Circle (162) On Reader Service Card

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Audiopak A2 (110), various lengths, most :70 to 1:40, $1.50/each or $150/all; Micro-Trak 72 cart Lazy Susan, $50; Fidelipac 96 cart rack, $75; 10" reels of blank tape, Best Offer. M Meyer, KLQP, Box 70, Madison MN 53256. 612-598-7301.

Fidelipac Master Cart (red), 350 carts, many 2 1/2 to 3 minutes, $75 cents/each, $250/all. Verne, WWJQ/WJQJ, 5658 143rd Ave, Holland MI 49423. 616-394-1260.

Want To Buy

Phonograph records from 1950-1970, all music types, 45s, 33s, 78s & transcriptions, top prices paid, will travel. B Berry, Karavan Broadcasting, 13 Montgomery Pl, Conroe TX 77384. 409-321-2920.

Fidelipac/Audiopak Mastercart II gold or AA-4 light blue in 2:30 through 4:00 lengths, must be in very good condition, call after 3PM CST. 214-271-7625.

Phonographs from 1950 to 1970, all types of music, 45s, 33s, 78s and transcriptions. B Berry, Karavan Broadcasting, 13 Montgomery Place, Conroe TX 77384. 409-321-2920.

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Want To Sell

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Hewlett Packard 332A distortion analyzer with AM detector, $595; HP 333A distortion analyzer, $695; HP 334A distortion analyzer with AM detector, $795. R Sumner, CAVU, 44632 Guilford Dr, Ashburn VA 22011. 703-450-2288.

Tektronix 2215A 60 MHz oscilloscope, new, $1200. Armando, KSJV Radio, 209-498-6972.

Eico 378 audio generator to 110 kHz, Best Offer; Monarch FS1-3 VSWR meter, Best Offer; CSC Design Mate II function generator, 1 Hz to 1 MHz, square, triangle or sine wave, Best Offer; Micronta hand-held signal-tracer, Best Offer. D Jackson, 203-762-9425.

Want To Buy

Belar FM stereo mod monitor system or equivalent. R Coleman, 309-944-4633.

Nems-Clark/RCA WX-2 or equivalent field intensity meter, good working cond, in calibration, $400 or so. A Crain, WLVV, POB 1404, Collierville TN 38017. 901-854-7148.

TRANSMITTERS

Want To Sell

BE FX-30 30 W exciter, xlnt cond, $3495. J Arzuaga, WQQZ-FM, POB 980, Quebradillas PR 00678. 809-895-2725.

Energy-Onix 10 kW AM, in service 5 yrs, exc cond, $20,000. T Gray, WSML, 910-227-4254.

Bdct Electronics FM 1C, 1 yo, SS w/FX50 exciter, $10,000/BO. F Befera, KUSZ, Box 7200, Duluth MN 55807. 218-628-2324.

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World Radio History

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Harris System 90, parts only, Best Offer. M Watson, WSCZ, POB 1247, Greenwood SC 29648. 803-223-8553.

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Motorola C-QUAM AM stereo exciter, BO; Orban 9100A AM stereo multiband processor, $2500/BO. D Matyis, KVET/KASE, 517-495-1300.

RCA, Harris, Collins 1 kW, 5 kW, 10 kW, 20 kW, excellent condition, $3,700 - $20,000. Scott, DS Communications, 5859 Shanymist #3, Cincinnati OH 45239. 513-385-0130.

Collins 20V-2 compliant transmitter with manual & spare audio chassis, 1 set tubes, partial power supply & assorted parts, $2500. D Kerl, 2309 Co Rd Y, Hatley WI 54440. 715-446-3619.

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CSP 5 kW dummy load, originally built for 1410 kHz, $500; CSP 600-001 RF switches (4); capacitors 1960 (2), .00025, 10,000 V, 5.5 amps; G3B, .00015, 15,000 V, 16 amps; .003, 12,000 V, 24 amps; .001, 20,000 V, 13 amps. L Fuss, WDTL, POB 1438, Cleveland MS 38732. 601-846-0927.

Gates TE-1 exciter, tuned to 95.2 MHz, as is, $200. L Fuss, WDTL, POB 1438, Cleveland MS 38732. 601-846-0927.

Gates DC1G 1 kW transmitteer, Best Offer. H Shumway, KTIM, 801 W Wickenburg Way, Wickenburg AZ 85390. 520-684-7804.

Gates FM-250C FM transmitter, works, compliant with TE-3 Gates exciter, on 91.7, spare power amplifier, $1500/all. M Taylor, KNEO-FM, Rt #1 Box 1821 Hwy 86, Neosho MO 64850. 417-451-5636.

Harris stereo exciter, mint with manuals, $200. G Collins, WDOC, Univ Dr, Prestonburg KY 41653. 606-886-8409.

Motorola C-QUAM exciter, needs new meters for front, $1000 or trade for carrier current broadcasting transmitter. J Kesler, POB 644, Livingston KY 40445. 606-843-9999.

Powerpak SMG-40 stereo generator, good condition with manual, $400/Best Offer. D Thompson, 510-609-8631.

Harris FM 2.5 k with MX-15 exciter spares, like new, $12,500; ERI 2-bay low power Rototiller, 107.1 mHz, $2200; Harris/Gates FM 2.5H3, ok condition, $5995. Chris 816-628-5959.

Want To Buy

5 kW AM xmtr, prefer Harris MW-5 or comparable/better. Robert, 904-477-6688.

5 kW - 25 kW, any kind; STL xmtr & rcvr non type accepted ok; also STL dishes. Scott Communications, POB 10262, Amarillo TX 79116. 806-356-6916.

Used FM transmitter, 15-25 kW, 99.3 MHz, with exciter if available & manuals. A Ward, 911 N Lake Havasu Ave, Lake Havasu City AZ 86403. 520-855-9000.

McMartin AM/FM transmitter, any model, exciter or stereo modules. Goodrich Enterprises, 11435 Manderson, Omaha NE 68164. 402-493-1886.

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3CX10,000A7	4CX250BT
3CX3000F7/8162	4CX250BC/8957
3CX3000A7	4CX250B/7203
3CX2500H3	4X150A/7034
3CX2500F3/8251	5CX1500B
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Russco TT (4), $100. G Collins, WDOC, Univ Dr, Prestonburg KY 41653. 606-886-8409.

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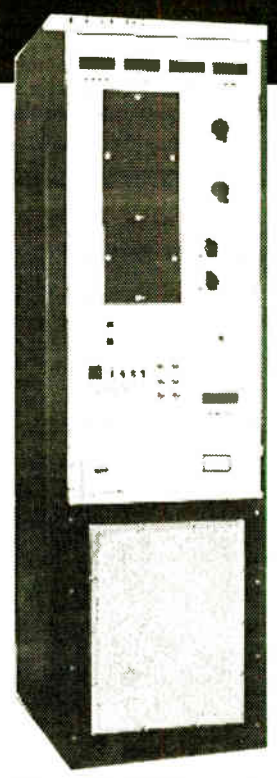
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World Radio History

EMPLOYMENT

To place ads in this section, use the ActionGram form. To respond to box numbers write Radio World, PO Box 1214, Falls Church, VA 22041. Attn:_____

POSITIONS WANTED

Chief Engineer, corp technical director, career technical background, small and major markets and consulting firm, w/DJ, prog, op mgr and stn mgr reality seasoning, resume and ref, Ted, 409-863-7651.

Chomping at the bit to rock the west coast, killer prod & copywriting, w/a real rock 'n roll attitude! G Brown, 918-341-7929.

Creative comic to straight man, I'm your man, many character voices, tops in writing & production, work well alone or as side-kick! B Griffin, 918-743-7679.

From DJ to sales to management to owner, ready for new challenge, I know radio. Anthony, 800-779-4737.

Give her any format and this lady can deliver, good voice, very creative writing & production, ready to work hard for your station! T Caldwell, 918-321-5710.

Looking for a talented individual for prod, voice overs or announcing? Recent graduate ready to work, OK preferred. 405-733-7736.

Medical/Health News reporter will relocate anywhere, copy writing, on air production, narration, interviews health professionals, FT or PT. Larry, 702-361-7018.

Morning sidekick, killer production including MIDI and DM-80 digital, SBE cert pending, very visible, easy to work with, NE, Midatlantic only. Allen, 717-541-5154.

Recent grad willing to relocate to any state, people say she is an amazing worker, find out if it is true. Marlissa, 405-273-9122.

Young, energetic, currently employed, play-by-play man w/6 yrs exper & strong prod skills looking for better opportunity, can work alone, willing to relocate. Derek, 505-392-5367.

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Innovative, leadership-oriented PD/morning air talent seeks Midwest challenge, turnarounds a specialty. Ron, 612-774-0673.

Ready to rock your listeners' socks off, bright young talent, willing to do what it takes, able to start immediately! Steve, 918-742-1227.

Recent grad seeking on-air/prod position, ready to rock & roll your station, will move anywhere, interested? Matt, 405-755-8344.

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Versatile, intelligent, great for start-ups or existing stations, wants F/T air-shift, tst PD gig, never promoted, tired of unrated markets, uncompetitive pay. Janet, 502-895-5888.

30+ year broadcast pro seeks new opportunity. Full knowlegde FCC and FAA rules, construction planning, major equipment purchasing, turnkey construction, high power FM and AM DA construction and mantenance, will relocate. Radio World, P.O. Box 1214, Falls Church VA 22041. Box RW95-5-31-1RW.

HELP WANTED

Groups of 6 radio stations in Northeast seeking experience chief. Knowledge of RF, studio maintenance, computers, digital audio a must. Good pay and benefits. Reply to: Radio World, P.O. Box 1214, Falls Church VA 22041. Box RW95-5-31-2RW.

CE for 10 kw AM DA-2 contemplating new studio construction. Resort community, western state. Competency in: AM DA's, PC computer systems, PC computer networks, TVRO studio/RF construction, maintenance, FCC compliance. Minimum five years experience and FCC General Class Permit. Resume, references, salary expectations, and credentials to: "Resumes" at 2950 SW 2nd Avenue, Fort Lauderdale, FL 33315 or FAX to 305-524-8734. EOE.

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KMOX Radio, a CBS-owned radio station, has an opening in the Technical Operations Department. This job requires a minimum of five years experience in broadcast technical operations; that experience must include both AM and FM transmitter maintenance. Trouble-shooting at the component level for audio, RF and digital systems highly recommended. Two years of college or post high school training a plus, as well as computer literacy. FCC General Class License or SBE Certification desirable. No phone calls, please. Send resume to:
Manager, Technical Operations
KMOX Radio
One Memorial Drive
St. Louis, MO 63102
CBS is an equal opportunity employer. Women and minorities are encouraged to apply.

Immediate opening for FM Chief Engineer — also to assist with AM stations. Computer experience a plus. FCC and or SBE certification required with 5 years experience. This is an equal opportunity employer. Please send resume to:
David Toups, Dir. of Engineering, WFBC/WSPA/WORD, 501 Rutherford Street, Greenville, SC 29609

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James Stanley, Director of Engineering
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Minneapolis, Minnesota 55402
Colfax Communications is an Equal Opportunity Employer.

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Copy & Mail to: Radio World, PO Box 1214, Falls Church, VA 22041, or FAX to: 703-998-2966

ABOUT OUR EMPLOYMENT SECTION

HELP WANTED: Any company or station can run "Help Wanted" ads for $1.50/word or buy a display box for $60/column inch. Payment must accompany insert, use your MasterCard or VISA; **there will be no invoicing**. Blind box numbers will be provided at an extra charge of $10. Responses will be forwarded to listee, unopened, upon receipt. Call 800-336-3045 for details.

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World Radio History

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