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January/February 1997/$10.00

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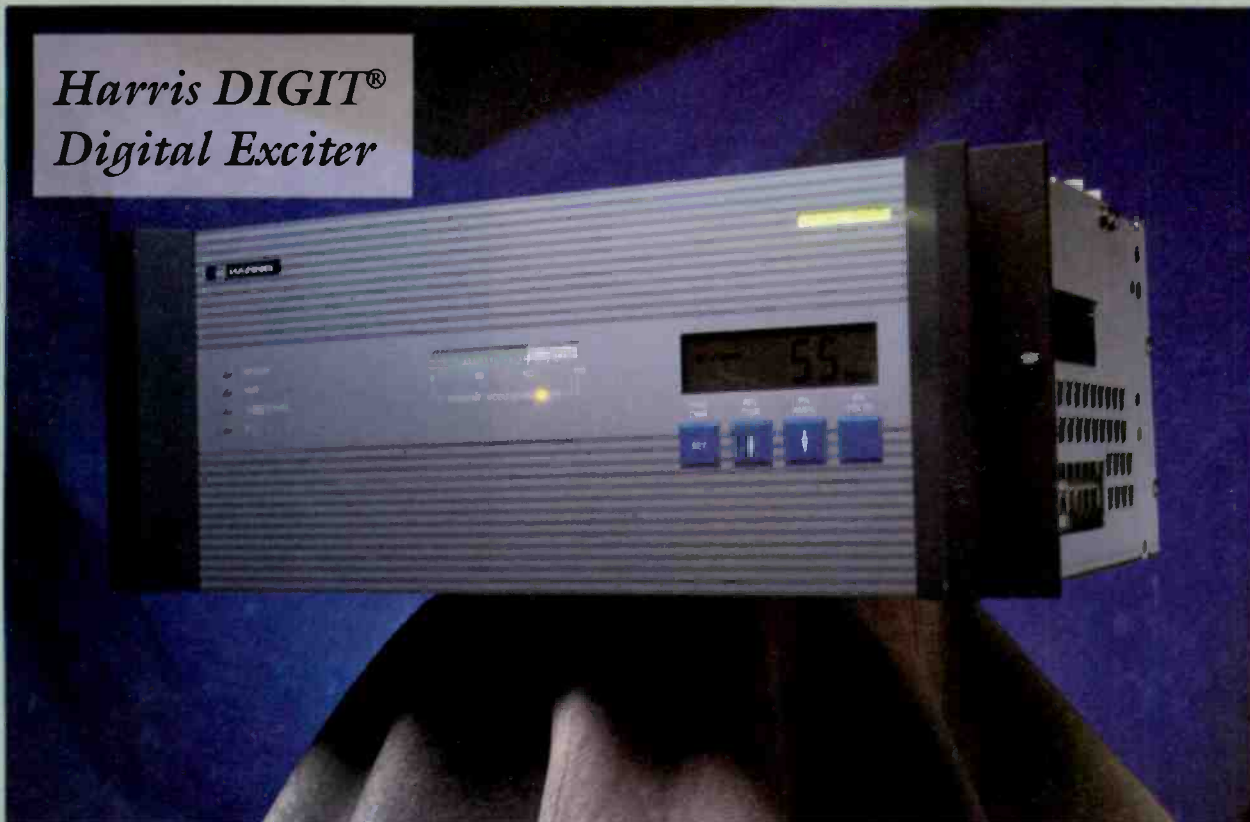

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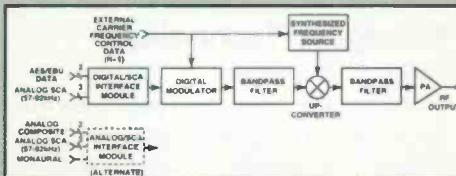

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ON THE COVER: The art of radio production has some new, high-tech tools, but its ultimate source is still the producer. (Illustration by Tim Grace.)

If you need more professional help than this the new DSE 7000FX has a shrink on board.

Relax. Lie back. And think about all those times you were editing spots, racing against a deadline, and suddenly you had to send out for sound effects. Is it any wonder you need professional help? Well, consider this sound therapy.

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You'll also find that the fastest workstation in radio has gone *turbo*. With added processing power, you'll get more spots done. Be able to add more effects. And on those occasions when sessions get ugly and your :60's seem to run into :70's, relax. The DSE's time compression will shrink to fit.

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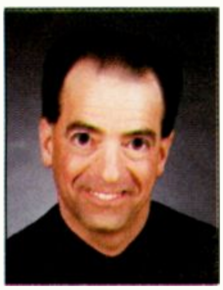
Déjà vu

Anyone who has dabbled with on-line audio knows how frustrating an experience it can be. Its problems run the gamut from hardware to software, with users seemingly in constant search for faster modems, wider-bandwidth connectivity and better-sounding streaming audio algorithms.

Most broadcasters sit back and chuckle at this predicament, also taking solace in webcasting's essentially non-mobile nature. Although possible with a laptop and a cellular modem, audio surfing on the web is nowhere near as convenient, cheap or reliable as a portable or car radio.



And yet, the web's users keep on coming. Sure, they complain a lot, but something holds their interest, and plenty of new users log on every day. Is it just more proof of Lily Tomlin's theory that humanity invented language to satisfy its deep-seated need to complain? Is it just the technical challenge and novelty of getting the system to work? Or is it the *content* of the services users receive (when they finally get connected) that's driving the fervor for this new medium?

A look at broadcast history may be enlightening. Recall that early radio listeners were largely hobbyists and enthusiasts who built their own radios (or had someone build the radio for them) from kits. Early reception was plagued by poor fidelity and plenty of interference. Successful reception required a lot of antenna tweaking and some luck besides. There were no truly portable or mobile receivers. Radio listening was a sit-down-in-front-of-the-big-glowing-box-and-cross-your-fingers kind of exercise. Does this remind you of anything?

The value attributed to early radio's content kept these tenacious listeners involved and enthusiastic, and gradually the problems of the medium subsided. Interference was reduced, radios became a more off-the-shelf item, reliability of reception improved, and mobile listening became possible. The popularity of the medium grew with each improvement, expanding beyond the exclusive province of the hobbyist. Before long, radio listening was a mainstream function of everyday life, and the medium flourished.

The parallels here are strong. Just as Marconi never envisioned the use of his invention for point-to-multipoint distribution of entertainment and information, neither did Bell nor the founders of the Internet foresee this application for their developments. It happened once; it could happen again. Most observers agree that on-line bandwidth availability will continue to improve — including the wireless variety. This could soon solve the quality, cost and reliability problems of today's webcasting. It's not a big leap from there to envision the dedicated, portable on-line audio surfing device: a cellular/PCS webphone with speakers or headphones and an LCD screen (a text-only version already exists). Finally, consider the speed at which these improvements can occur. Have you encountered the term "Internet decade" yet? It's defined as being *six months* long.

All this means that radio had better be ready to make its move on-line. There's no industry better-suited to be a provider of audio content, and this asset should be leveraged as stations move to add alternate delivery styles to their existing suite of on-air services. (See cover story, "Creating Content," p. 22.) Remember what grew from those difficult early days of wireless, and apply those lessons to the new "wired frontier." The right blend of content and service could create successful results that seem strangely familiar.

Skip Pizzi, editor

P.S.: Apropos of such media metamorphosis, a new column debuts with this issue. "The Last Byte" will appear on the last page of each issue. (See p. 70.) The title refers not simply to its location, but also to its content, which will generally cover radio/audio technology for the *consumer* — the broadcaster's "last mile." Let us know what you think at the destinations below.

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Coexisting with cellular

By William Fawcett

Cellular telephones have had the most profound effect on the communications industry of any new technology in the last 20 years. Ask most tower contractors today and you're likely to find that 80% of their business is related to cellular — and more recently, personal communications systems (PCS) — installations.

For the broadcaster, the cellular industry has dramatically changed the tower rental business. Many cellular operators prefer to build their own towers. This is good for broadcasters because it may offer them more suitable locations to find rental space for their own facilities. Conversely, in locales where there are restrictions on additional towers, cellular operators may turn to broadcasters to rent space on *their* existing towers as cellular operations expand. The availability of emergency power, a common feature at broadcast and cellular sites, makes either facility even more attractive. Cellular operators make good tenants. Because of the large capital investment required, most cellular operators have stable business operations, and are used to paying their bills on time.

With proper care, broadcast and cellular operations can be good neighbors.

Although each area typically has only two cellular operators, the emerging PCS industry may support perhaps six operators in a specific region. Considering that a fully built-out PCS system will require a site every two miles, the demand for tower space is simply staggering. Tower rental is an alternate revenue stream that every broadcaster should fully investigate.

Some caveats

Contract law is an exacting field. If you aren't experienced in this area, you must find someone who is. Everything and anything can (and should) be negotiated. In a tower lease contract, there are usually 25 to 35 different points that need to be addressed. Obtain samples from other broadcasters involved in leasing, and find out from them what works and what doesn't.

One important aspect to cover is shutdown procedures. With the new RFR regulations, it's often not possible to work on a tower while a broadcaster remains on the air. Specify under what circumstances and when you will be willing to shut down to allow the cellular company to perform on-the-tower maintenance. You have more say over this if you control the site, but this point is often overlooked by broadcasters renting space on someone else's tower.

AM broadcasters must allow for additional expense to re-tune and bridge their tower after a cellular installation. The expense of multiple iso-couplers on a series-fed tower can be great; a better solution might be conversion to a shunt-fed unipole. For a stable operation, be certain that all coax is bonded to the tower every 20 feet or so. With all of the additional expenses involved, it's likely that there won't be too many cellular operations on AM towers.

As an aside, if a cellular (or other) tower sprouts up near your AM directional array, you may be able to require them to de-tune their tower and commission a directional proof to certify that they have not distorted your pattern. Protect your investment.

Interference is another factor. Again, the controlling party has the upper hand, and will usually specify how interference *to* their operation will be handled.

Cellular interference

Seldom, if ever, would a cellular system interfere with a radio broadcast operation. Cellular telephones operate in the 800MHz band, specifically 824 to 849MHz and 869 to 894MHz. The "band plan" for the cellular service is detailed in 47 CFR 22.902 and is illustrated in Figure 1.

To understand this plan, some terminology must be defined. In each service area, the cellular band is divided up into two blocks of 416 channel pairs each. Half go to the "A-system," with the remainder to the "B-system." The B-system operator is often spoken of as the *wireline carrier*, meaning the B-operator may also be involved in landline telephone service (such as GTE or a Regional Bell Operating Company [RBOC]). The A-operator will gener-

ally be a wireless-only firm (like Cellular One), although there are exceptions to this rule.

Each channel pair consists of a *mobile* (subscriber) transmit frequency and a *base* (cell-site) transmit frequency. The base frequency is always 45MHz above the mobile frequency. Naturally, the cell site "listens" on the mobile's transmit frequency and vice-versa.

Twenty-one channel pairs in each system are designated as *control pairs*, also known as "paging frequencies" (although they have nothing to do with your pocket pager). These channels are defined in 47 CFR 22.902(c) and they are in the center of each frequency segment. The control channels handle the initial "handshaking" with the mobile units, set the mobile's power level based on received signal strength, assign a voice channel to an active unit, and control the handing-off functions as a mobile moves from cell to cell. If you're looking at cellular channels on a spectrum analyzer, the control channels are the ones that are always active. You can use these control channels' frequencies to identify which cellular site you are "looking at."

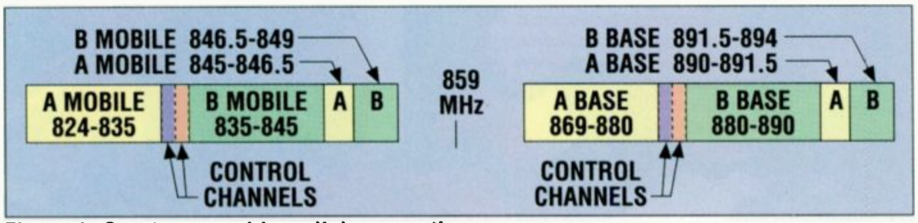

Figure 1. Spectrum used by cellular operations.

Besides the low likelihood of interference with AM or FM broadcast transmission, it would also be unusual for cellular service to interfere with properly maintained 950MHz aural STL systems, either. Because cellular frequencies are above the FM band, harmonics will also not be bothersome to radio broadcasting. The reverse situation is not so simple, however. It's possible for an FM broadcast transmitter to cause severe interference to a large block of cellular channels.

The ninth or tenth harmonic of a broadcast transmitter may fall within the cellular band. Keep in mind that the FM broadcast transmitter is a wideband signal, and that wide bandwidth becomes even wider when multiplied 10 times. Practically speaking, an FM station's harmonic can span more than 45 cellular channels.

Frequencies between 91.7MHz and 94.3MHz may create harmonics that fall within the mobile portion of the cellular band. Frequencies between 96.7MHz and 99.3MHz can fall within the base portion. The remainder of the FM frequencies *by themselves* don't have harmonic relationships with cellular frequencies, although intermodulation products are always a possibility.

Even a harmonic that is *80dB down* can be problematic, especially in the mobile portion of the band. This is because the cell site is listening in the mobile segment for weak signals emanating from hand-held pocket phones. A 100kW broadcast station with a ninth harmonic attenuated a full 80dB might be putting out a signal equivalent to 10mW. That's not much, but if your transmitter is located near a cell site, it's enough to cause troublesome interference.

Solving problems

Some FM broadcasters may not meet the specific requirements of 47 CFR 73.317. Using older equipment, they operate under the "grandfather" clause of 73.317(a). However, that clause states that they must clean up their act in cases of harmful interference. Interference to cellular service is one of those cases. In one severe case, an FM broadcaster using only a quarter-wave stub was found interfering with two cell sites, one of which was eight miles away. In all, 50 cellular channels were affected. The installation of a modern low-pass filter (at the broadcaster's expense) brought instant relief.

Because of the profound effects of FM-band harmonics on cellular service, it's extremely important to verify harmonic levels all the way to 1GHz during your periodic RF proofs, especially if your frequency is one that has a harmonic relationship with the cellular band. A six- to nine-element yagi cut for the cellular band will allow you to get above the noise floor of your spectrum analyzer, and with triangulation, will allow you to identify the source of the offending FM harmonic signals. A list of control (and voice) channels assigned to each cellular site is a useful diagnostic tool. Your local cellular company should be willing to supply you with a list for such coordination and interference-mitigation purposes.

Even a harmonic that is 80dB down can be problematic, especially in the mobile portion of the band.

The emerging PCS technology in the 2GHz band should present no interference problems to radio broadcasters at all. It's possible that a PCS second harmonic could cause problems with your C-band downlink, but no instances of this happening have been reported.

Cellular is here to stay, and on balance it seems beneficial to the broadcaster. Astute engineers will make it their business to become familiar with cellular technology, not only to protect their broadcast interests, but to build a possible diversification in the services they can provide. Many cellular operators are inexperienced in troubleshooting interference, and antenna sweeps are another service in great demand. There's going to be plenty of work out there for the versatile RF engineer.

William Fawcett is president of Mountain Valley Broadcast Service, Inc., a broadcast engineering firm in Harrisonburg, VA.

Preserving computer investments

By Kevin McNamara

Today, you would be hard pressed to find any viable commercial radio station in this country that doesn't depend on some form of PC-based technology. Sure, everyone is aware of the digital audio storage and editing systems that are found in a rapidly increasing number of radio facilities, but how about those desktop PCs that are used for the common business functions? Their uses range from scheduling music to issuing invoices. In a time when fewer employees are responsible for more stations, the PC is no longer a convenience, it's essential.

- Examine the present situation:
  - Who uses/needs a PC at their desk?
  - What is the primary software used at each computer?
  - Does the present software address the station's needs adequately?
  - Are employees properly trained on the software that they use regularly?
  - Do duplicate and/or unlicensed copies of software exist on company-owned computers?
  - Are any PCs connected to a network?
  - Are computers properly matched to peripherals for given applications (e.g., best monitors used for workstations that create graphics materials)?
  - Are printers located optimally?
- Determine reasonable goals for each of the next five years (based on business needs, not technical speculation).
- Define the role of a manager of information systems or technology management consultant.
- Standardize specific software (includes operating systems, application packages and versions). Create a time table to remove old and unauthorized versions of software from company-owned PCs.
- Determine the number of software packages/site licenses required.
- Perform a needs analysis to determine any additional hardware and software requirements for the next year (including network requirements).
- Create a policy to deal with security issues.
- Create a policy about conduct on the Internet.
- Establish a training program.

Table 1. Some of the issues that should be addressed in a station's information systems strategic plan.

This fundamental truth of today's broadcast operations is causing untold anxiety among owners and station managers as they face a vexing dilemma: How to preserve investment in these vital computer assets at a time when the hardware and software requirements seem to change at least once a year?

Some common mistakes

Profitable investment in computer equipment follows a different set of rules, and like many other industries, broadcasters are learning this the hard way. Consider the following "seven deadly sins" of computer asset management, and see if at least some don't seem painfully familiar.

1. *Lack of a strategic plan:* Companies put a great deal of thought into staffing structure and hiring to fulfill the ultimate needs of the organization. Yet the selection of the computers and software that support these jobs is rarely given more than passing consideration. A recent study by the Gartner Group, Stamford, CT, found that a typical company spends an average of $38,000 over a five-year period for *support* of a single, stand-alone, Windows-based desktop PC running eight applications. That's more than five times what the company will spend on that average platform's hardware and peripherals during the same period.

Networked systems cost even more, with the per-workstation support tab averaging more than $10,000 a year. Multiply that cost by dozens of computers and you can see how the cost of deploying desktop PCs can easily get out of control. This is why you need to create, implement and enforce a strategic plan that deals specifically with the management of your information systems. (See Table 1.)

2. *Placing the engineering department in charge of all computer systems.* In many radio operations, the introduction of the desktop PC for critical applications came in the form of digital audio storage systems. This may have created the mindset that any computer is strictly technical equipment. A distinction must be made between computers that support technical operations and those that form your *information systems* (IS) infrastructure. Although both systems may be linked to transfer specific types of information — such as program schedule data between traffic and on-air PCs — each of those computers has a separate function.

Unfortunately, many managers believe that the engineering department represents the most logical and cost-effective solution to managing computer assets. This approach may work in larger technical operations where one or more engineer(s) can be dedicated to the task, but this isn't a typical case. A qualified person should be hired (either full- or part-time) to manage the station(s) computer resources. (See Table 2.) If you are uncomfortable creating a new position, consider hiring a technology management

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consultant. The consultant can evaluate the health of your present IS infrastructure and help create a sensible plan that fits your business goals.

3. ***Investing in the wrong equipment* and *trading computer equipment*.** These sins are almost always committed together. Here's the typical sequence of events in getting a computer for the station: 1) Employee needs a PC and tells supervisor; 2) Supervisor tells GM; 3) GM tells sales manager; 4) Sales manager tells account exec; 5) Account exec makes contact with several companies, ultimately finding a company that has a unit for which *no one* would pay them cash; 6) Done deal! New desktop train wreck delivered to station. Sound familiar?

These deals always end up costing you cash and/or time. Most computer vendors are working on small profit margins and consequently will not be inclined to trade an item that they can sell for cash. If trade is your only option, prepare a specification detailing your requirements, including a clause that states you will only accept reputable, name-brand systems (thus assuring you that service and support will be available for a reasonable period).

- Prior MIS experience including strong background with protocols, such as TCP/IP.
- Holds applicable networking certification(s), such as a Novell Certified Netware Engineer (CNE).
- Excellent interpersonal skills.
- Familiarity with major software packages.
- Internet experience including knowledge of HTML and JAVA (used for the creation of web pages).
- Understands the technology and stays abreast of trends that may impact purchasing decisions.
- Can maintain and enforce the company "vision."

Table 2. What to look for in a manager of information systems or a technology consultant.

4. ***Employees specifying equipment*.** Whether you're trying to learn new features of some software package or changing the motherboard on your system, you can find information about virtually any aspect of a PC, peripheral device or software, at any skill level. Now computer magazines are to the PC what the J.C. Whitney catalog was to the Chevy Impala 20 years ago. The PC has created a "techno-motorhead" culture: Employees (or friends) may be able to provide direction on purchases, but without expert guidance, you risk spending too much money for obsolete technology and could possibly miss out on newer, faster and more cost-effective solutions.

5. ***Lack of a software standard*.** It's pointless and costly to run different types of similar applications (such as using three kinds of word-processing programs to accommodate different employees' preferences). This situation usually crops up when employees bring in copies of their own programs and load them on the station's computers. It's confusing for employees when they routinely encounter different programs, and it tends to defeat any meaningful training efforts — not to mention the *huge* fines that the station is exposed to without proper site-licensing of software.

6. ***Improper training*.** Many companies have paid dearly to outfit their computers with high-end software packages that employees don't fully understand. Training for most popular software is reasonably cheap, ranging from $100 to $500+ per employee, depending on the program and skill level. Training is performed in classrooms equipped with a PC for each student, or you can hire trainers to come to you and train small groups on the station's computers. It's also important to have a library of books and manuals accessible to interested employees who want to learn more in their free time.

7. ***No security plan*.** Computer viruses, unauthorized access to sensitive information, destruction of important information, mischievous hacking, fire and theft are just a few of the potential disasters that your company is exposed to on a daily basis. A comprehensive policy to minimize the potential for such losses should be created as part of the strategic plan. This policy should include specific actions that would be cause for termination and/or prosecution if violated. The policy should be made clear periodically in writing to the entire staff and acknowledged with employees' signatures.

Lost data costs companies millions of dollars each year. If your station has Internet access, be sure that the policy outlines the specific type of material an employee is permitted to upload or download using company accounts, whether in the station or outside the station. At the very least, abuse of station Internet accounts can cause your company plenty in bad press and embarrassment. You need a comprehensive disaster recovery plan that deals with such issues as backing up data, the location of those backups and a designated facility that can be used to re-establish critical business functions in the event of a catastrophe.

Adapting to change

Although the use of PCs has realized exponential growth worldwide, some industries have been slower to react than others — broadcasting among them. In a business that routinely agonizes over reducing expenses, it's ironic that radio broadcasters have been among the most inefficient users of computer-based technology to date. Only recently have factors like consolidation, integration of work and information flow, and the desire for an Internet presence spawned a more leading-edge awareness among station owners and managers.

With the right people in charge and a clear plan of attack, operating a computer-based business can be profitable and efficient to levels never achievable in the past. Just don't try to play the new game by the old rules.

Kevin McNamara, BE Radio's *consultant on computer technology, is president of Exegesis Technologies, a consulting firm in New Market, MD.*

Improving FM transmission

By John Battison, P.E.

When considering the state of FM broadcasting today, perhaps its worst problem is caused by multipath reception. Although there's not much that can be done about the geometry and wave physics that apply to a particular set of transmit and receive antenna locations, broadcasters can perform some improvements that will ameliorate the audible problems that occur when multipath conditions are encountered.

Antenna systems

Because the vital last link in the FM transmission path is the antenna and its feeding system, it's extremely important to obtain the best possible installation when planning or moving your site. This includes all aspects of the radiating system and local terrain conditions.

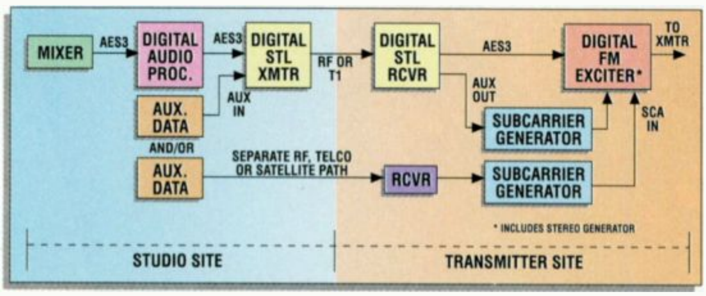

Figure 1. The all-digital FM air chain is a possibility today, and will become easier to implement as time goes on.

The antenna or transmission line may be contributors to a multipath-induced problem by producing parasitics that play havoc with signals. More often, however, transmitter tuning is the culprit, and it can be easily improved. Tuning for symmetrical group delay (i.e., equal group delay in the upper and lower sidebands) has been reported to reduce the distortion in a received signal when subjected to multipath conditions.

In some cases, directional FM antennas may help. Although they are normally used to prevent interference between short-spaced stations or to tailor the radiated signal to meet coverage requirements, directional antennas can also be used in an attempt to reduce or eliminate multipath problems. It's not unusual for a transmitter site to be in the vicinity of a single large reflector, such as a tall building or downtown group of buildings or perhaps a particular topographical feature that produces severe multipath to a major part of the listening area. A reduction in multipath may be obtained by suitably designing the antenna's radiation pattern so that a null or reduced power is directed toward this reflector.

A related problem is downward radiation, which can cause RFR compliance problems or RF interference to the transmitter building and nearby listeners. In these cases, a half-wave-spaced antenna can help, in which the 180° phase shift between upper and lower antenna elements results in a null directly below the antenna.

In some cases, it may be necessary to reduce downward radiation at an azimuth of other than 90° downward, such as where a null is needed to protect another nearby location. This kind of problem is found more often than you might suppose. For example, a university FM station may have a short tower on campus that is adjacent to a library or science labs. Even a low-power school station can play havoc with the library's electronic equipment or lab experiments. By changing the antenna element phasing to produce a null in a desirable direction, it may be possible to clear up the problem without getting into screened rooms and other expensive RF "hardening" of the affected buildings.

Changing transmission sites

Moving the antenna may also solve multipath problems — or at least relocate them to less problematic areas. For example, in a well-known lakeside city, the rooftops of two tall and relatively close buildings house most of the market's broadcast transmitters. Each building produces a strong reflection of the other's signals, but one's reflections are largely directed off-shore, while the other's affect a large part of the city.

Going to a higher site can help improve general coverage as well, both in town and on the fringe. Often, this can only be done by combining sites with competitor(s). When several stations get together and plan a single antenna with enough bandwidth to cover them all, an *RF combiner* will be required. The design and provision of this important piece of equipment will normally be the province of the antenna supplier, or more recently, by a transmission site operator (a relatively new type of business that manages a combined transmission site for stations).

However, it's the responsibility of each chief engineer to be sure that the station is properly designed into the system. Several types of combiners are commonly used. These include an older design known as the *Runout* combiner, along with newer models, such as the *Branched Star* combiner, the *Balanced* combiner, the *Notch-Filter Balanced* combiner and the *Isolator* (or *Circulator*) combiner. In major markets, the trend toward combined sites will likely increase, particularly as FM stations are kicked off TV towers that need capacity for their ATV channels.

Continued on page 62

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FCC examines regulatory fee structure

By Harry C. Martin and Richard Estevez

The commission recently initiated a Notice of Inquiry (NOI) to develop a better methodology for assessing FY 1997's regulatory fees for AM and FM stations. The NOI addresses a proposal submitted by the Montana Broadcasters Association. It outlines a new method of assessing regulatory fees that take into account market size.

Currently, the commission bases a radio station's annual regulatory fee only on its license classification. The Montana Broadcasters Association has proposed a methodology where regulatory fees would be based on the station's class and the size of the station's service area. Stations in more heavily populated areas would be assessed a higher fee, while smaller-market stations would pay less.

The Montana proposal uses the concept of radio markets, similar to those used in the assessment of TV regulatory fees, determined by the Arbitron market size. The proposal would create four separate radio market classifications: Markets 1-25, Markets 26-50, Markets 51-100 and Remaining Markets. The Montana proposal would also take into account the license classification. (See Table 1.)

MONTANA PROPOSAL						
MARKETS	AM CLASS A	AM CLASS B	AM CLASS C	AM CLASS D	FM CLASS I*	FM CLASS II*
1-25	$2,890	$1,710	$645	$815	$2,890	$1,940
26-50	$2,040	$1,140	$455	$575	$2,040	$1,370
51-100	$1,360	$760	$305	$385	$1,360	$910
REMAINING	$850	$475	$190	$240	$850	$570
REVISED MONTANA PROPOSAL						
MARKETS	AM CLASS A	AM CLASS B	AM CLASS C	AM CLASS D	FM CLASS I*	FM CLASS II*
1-25	$11,500	$6,325	$2,575	$3,150	$4,875	$3,250
26-50	$6,675	$3,675	$1,500	$1,850	$2,850	$1,900
51-100	$3,550	$1,975	$800	$980	$1,525	$1,000
REMAINING	$1,000	$555	$225	$275	$430	$285

* CLASS I INCLUDES FM CLASSES C, C1, C2 AND B ** CLASS II INCLUDES FM CLASSES A, B1 AND C3

Table 1.

The numbers in the Montana proposal don't take into consideration the increase in the aggregate amount of fees to be recovered by the commission that was adopted subsequent to the proposal's submission. The FCC has revised the Montana proposal to reflect the mandated increases. (See Table 1.) As the revised chart demonstrates, stations in larger markets will have to pay substantially more in comparison to stations in smaller markets.

The commission is concerned over such a result because although larger markets have more potential listeners, they also have a greater concentration of stations, and thus more competition. Comments and replies regarding the original and revised Montana proposal were due in December and early January.

EEO hints for renewal applications

One of the most important components of a broadcast license renewal application is the Broadcast EEO Program Report (FCC Form 396). The EEO Program Report solicits data on recruitment, hiring and promotion of women and minorities during the year prior to the filing of the renewal application. Inadequate recruitment and hiring of minorities can be a major problem at renewal time.

Prior to granting a renewal application, the FCC analyzes the data contained in the EEO Program Report and the station's annual employment reports (which must be filed by May 31 each year) to determine whether the station's recruitment, hiring and promotion of women and minorities have been adequate. Careful preparation of the EEO Program Report helps stations avoid fines, reporting conditions and short-term renewals.

The most important steps toward preparing the EEO Program Report are adequate recruitment efforts and careful maintenance of recruitment and hiring records. For each position filled at a station, records should be kept regarding recruitment sources contacted and the minority status and source of each applicant, interviewee and individual hired. All recruitment and hiring records should be carefully reviewed prior to preparing the EEO Program Report, so that all beneficial information can be included.

Although the EEO Program Report form asks for examples of sources contacted and contains only a few lines for insertion of information, all recruitment sources should be listed. In addition, all minority applicants should be listed, including walk-ins, unsolicited resumes and referrals from business associates, if they are viable candidates for a position filled during the year covered by the report (e.g., a person with no engineering background would probably not be a viable candidate for a chief engineer's job). If additional space is needed, exhibits may be attached to the form.

Harry C. Martin and Richard Estevez are attorneys with Fletcher, Heald & Hildreth, PLC, Rosslyn, VA.

dateline

Radio stations in Texas must file their renewal applications on or before April 1, 1997. Commercial stations in the following states must file their annual ownership reports on or before April 1, 1997: Delaware, Indiana, Kentucky, Pennsylvania, Tennessee and Texas.

Creating content

New technologies are making production easier and faster — at just the right time.

BY SKIP PIZZI, EDITOR

Call it content, programming, music, news, audio, whatever — it's the essence of radio, and it's what brings listeners to the medium. What brings them to *your* station or service instead of others is the unique content you provide. Although it's often thought that this preference flows simply from the station's "format," much of the appeal of a particular radio station comes from the exclusive elements of its programming — its *local content*.

Typically, this content includes the sonic signatures of the station or service — its liners, themes, jingles and promo spots. It may also extend to some longer-form programming, such as locally created news, public affairs or music programs. Perhaps most importantly, for most radio stations, local production plays a key role in the lifeblood of the operation — the advertising process. Although national and other large accounts can afford to have their spots produced at outside studios, many smaller advertisers don't have any "creative" in the can, and they rely on the station at which they are placing advertising to produce their messages as well.

Clearly, the creation of audio content at every level of the industry — networks, syndicators and stations — is a critical part of the radio business. It serves the programmer's own promotional needs, as well as the demands of listeners and advertisers through its development of specifically targeted audio material. Any substantial change to this process should, therefore, be of great interest to radio professionals. The current movement toward the use of digital systems represents just such an important shift.

CONTENT IS THE KEY

This trend toward enhancement in local production capabilities comes not

Photo: At San Diego country station KSON-FM, Bryan Main records an announcer's voice tracks directly into a production room's DAW. (Photo courtesy of Orban.)


DSE 7000

a moment too soon as radio broadcasters brace for the arrival of new competition. Whether this competition comes from the wired (Internet or cable radio) or wireless (satellite DAB) domains, or both, it is likely that it will not be a highly localized service. A radio station's chief exclusive asset will remain its local content, so this trump card should be played to the hilt. Now is the perfect time to develop and expand a radio station's creative infrastructure to allow it to produce an increasing amount of local content.

Many listeners may not even realize how much they hear and rely on a radio station's local content — until it's gone. A station's format may indeed attract listeners, but the local content and particular style of the station is what keeps them or drives them elsewhere. One of the primary criticisms of today's cable and direct-to-home (DTH) satellite radio services has been a lack of human content and local information, making the programming seem more like high-quality background music than real radio. To counter this, future cable/DTH radio may include announcers and other continuity elements, but this is also not expected to include significant *local* content. The same applies to most current and proposed on-line audio services, as well as future DAB programming delivered by mobile-receivable satellites — Satellite Digital Audio Radio Service (S-DARS), in FCC parlance, which may be licensed later this year. (See "News," November/December 1996.)

An enhanced ability to create content may also allow stations to produce programming or advertising for use on other transmission services. This could allow broadcasters to turn lemons into lemonade by providing programming for some of the emerging audio services just mentioned. (See "The Future of Radio," September/October 1996.) It could also be applied (and in some cases, it already has been) to the current trend toward consolidation of station ownership. In such cases, one flagship station with highly developed production facilities can produce material for many smaller stations of the group.

This "remote production" concept can also take advantage of another emerging technology: the digital audio distribution network. These services can be employed to allow cost-effective, file-based (i.e., non-real-time audio data communications) transfers of produced programs or spots from a central production facility to stations. The same network can also be used to send "raw" audio elements (announcer voice tracks, advertiser-provided audio, phoner bits, etc.) from a local station to the production center for use in the creation of spots or programs for that station.

NEW TOOLS FOR THE OLD TRADE

Although radio production aesthetics still revolve around the seminal techniques of aural storytelling, entertainment and persuasion, the tools used to create today's programs are changing drastically. At the center of this change is a single trend that has been working its way through the industry for most of the last decade: The traditional use of a series of discrete devices for record/playback, mixing and processing of audio is being replaced by a more monolithic single device — the *digital audio workstation* (DAW).

Creating content

It is fairly well-known that DAWs are available in three basic types, defined by the computer upon which they are based: the Apple Macintosh, the IBM PC or a non-standard ("proprietary" or "dedicated") computer. Among the many variations between DAW systems, this is the most basic distinction. More important to most users, however, are other issues, such as user-friendliness of the human interface, processing speed/power and reliability.

The gravity of platform choice has grown recently as the issue of networking emerges. The days of the single, stand-alone DAW are fast receding, with the "sneakernet" method of audio transfer (via removable media) being replaced by *local area network* (LAN) interconnections between DAWs, news terminals, traffic/programming PCs and on-air delivery/automation computers. For optimum reliability and lowest cost of support, it is almost mandatory in such networked configurations that all computers be of the same platform type. While DAWs may come in three flavors, most of the other computers and software used in the radio environment (particularly the on-air audio delivery/automation systems) are strictly of the IBM PC type.

Studio 1 at the BBC's Yalding House in London features multiple computer-based production systems. (Photo courtesy of SADiE.)

This argues for PC-based DAWs at most radio stations (of which there are now several systems highly appropriate for radio production). On the other hand, pure *production* operations without an on-air delivery component to their businesses can still choose from the wider universe of platforms without penalty. In addition to the radio-friendly PC systems, this includes several Macintosh-based and proprietary-platform systems that are also quite useful for radio production.

POWER TO THE PRODUCER

The value of integration in the DAW is

Downsides of the DAW

By Steve Rowland and Skip Pizzi, editor

Digital audio workstations (DAWs) have had a major impact on the world of professional audio production. There is no question that a decent, high-end workstation can accomplish tasks impossible in the analog domain.

Although there are some applications in which razor-blade editing a reel of analog tape is still the most time-efficient, producers and stations are increasingly turning to DAWs for their more complex projects.

AN UNANTICIPATED PROBLEM

As with any bit of progress, there are a few downsides that accompany this trend: 1) cost; 2) the learning curve of digital production; 3) potential for mysterious and total loss of work on occasion; 4) backup and archiving requirements; and 5) isolation. The last item may seem puzzling, but it turns out to be an unexpectedly serious problem for many producers who have moved to DAW production.

In any creative endeavor, there are penalties to be paid when one person does too much work alone and without feedback from others. Traditionally, most producers of radio programs or spots would necessarily encounter collaborators, either in gathering audio elements, writing the script or mixing the final product. As the work progressed, this interaction would inevitably expose the producer to variations or completely new ideas, and the project would grow. This iterative process of idea-sharing is invaluable in its benefits to the end product.

These working relationships and delegations can also allow the producer to concentrate on purely creative concepts and let others worry about the execution of those ideas.

CONSOLIDATION OF LABOR

Now enter the different world of an "I-can-do-it-all" digital audio workstation. A station or producer can buy a DAW for the production studio or perhaps the producer's home. The user(s) will probably need a few weeks to learn the system and debug the platform. Thereafter, producers can work without waiting in line for studio time at the station or incurring exorbitant bills at an outside production house.

But hang on: For some producers, this is a steep hill to climb. Learning how to mix, how and when to use equalization/compression/limiting and other effects, where to set levels, pans, sends, returns, buses, along with a myriad of other details — all in a couple of weeks — is a lot to ask. Consider also the basic computer or operating-system (e.g., *Windows 95*) literacy that some producers may also have to acquire on such a fast track. Is this a realistic expectation?

Naturally, the answer depends on the individual producer. But either answer will be accompanied by problems. If the producer can't hack it, the DAW will be relegated to a distant desktop and traditional techniques will prevail. The production equipment budget may seem improperly spent. Yet if the producer excels at the DAW's operation, other more elusive problems may occur.

LONELINESS OF THE LONG-DISTANCE PRODUCER

The first difficulty encountered by the DAW-based producer is the distraction of logistics. A lot of the producer's brain power is expended in just getting the audio into and out of the computer, and in getting it to "sound right." This may result in a lot of worrying about all of the technical details instead of worrying about the creative processes of the mix — a risk of missing the forest for the pine needles.

Second, there is little or no human interaction. Sure, this is the

Creating content

primarily evidenced in its speed of production, although its space-saving advantages are also noteworthy. Having a unified recorder/mixer/processor on the desktop is powerful stuff for the competent operator or producer. It allows great creative control, fast working and high audio quality in the end product. Perhaps most important is the DAW's encouragement of experimentation, however. A DAW's speed and convenience may make a producer more willing to attempt a variation that might have been considered too difficult or time-consuming with traditional equipment. Furthermore, an "undo" command is all that's required on the DAW to revert a production to its previous form, should the variation prove unsuccessful.

One specific technique in vogue among producers of radio spots today is the use of several different processing treatments in rapid succession on the same announcer's voice. This is often accompanied by a slight overlapping of the announcer's lines, as if the lines were being read by several different announcers, each in different acoustical spaces, in real time. (The technique traces its roots back to detective stories from the golden age of radio drama, although it has been considerably advanced and adapted by contemporary radio artists like the Firesign Theatre and Ken Nordine.)

Some DAWs offer multiple screens for simultaneous viewing of different processes, such as this music production room at NPR headquarters in Washington, DC. (Photo courtesy of Sonic Solutions.)

Most DAWs lend themselves remarkably well to this technique. A linear voice recording is easily edited and split apart into several sections, with each section assigned to a separate *virtual track*. Using "point-and-click" (or "drag-and-drop") screen commands, the start point of each track can then be adjusted in time so that it begins just before the preceding section ends. (This is usually called "time-slipping," and is a key technique not possible with conventional multitrack production equipment.) Finally, many DAWs offer *digital signal processing* (DSP), with which a different equalization, compression, pan position and reverberation can be assigned to each track. Some DAW designs allow these multiple processing settings to be applied in real time as the mix occurs. Multiple iterations and variations can be attempted in an automated-mixdown fashion until the "perfect" mix is built.

The original files can be stored and the mix recalled and revised at a later session for other uses or updates. For example, the same generic spot can be used in different markets with the change of a single line or tag. Once the

producer's piece, and now all control rests in his or her hands. But how reliable is the producer's judgment at the end of a 10-hour, all-night session spent alone gazing into a video monitor? A little personal contact goes a long way to break up the stress of such sessions ("What if we tried it this way?" "Do you think that works?" "I know an effect that would work well here," etc.). The DAW empowers a station to create an environment in which that kind of interaction may rarely occur.

Technology can provide a partial solution by allowing POTS or ISDN interconnection between the isolated producer and others for auditioning of production work. Or the station-based producer can (and should) force other staffers to come into the studio to listen and critique. But this is often done only at the *end* of a production, whereas some of the most useful feedback often occurs earlier in the process. In the case of telecommunicated feedback, there may also be a lot of waiting around for responses, which can deflate any momentum a producer might have built up during a particularly creative session.

SOLVING THE PROBLEMS

The answers to this dilemma aren't entirely clear, but the issues should be acknowledged up front. Producers and managers must be aware that the DAW is not a complete panacea and the ultimate engine of a station's production efficiency. Consider the practical, technical and aesthetic advantages of the DAW — or an interconnected network of DAWs — and exploit them. But don't forego the beneficial elements of the production process that producers and engineers have developed successfully over the years.

Producers who have moved to DAWs and work with them in solo fashion report that about half the time they love it, and half of the time they're desperate for a second pair of ears or some operational help. Clearly, the DAW gives producers an increase in creative control, but the isolation it engenders must be addressed.

Acknowledge that the operation of a DAW (especially the more powerful systems) may be a specialty unto itself, and that some producers may be better off working with such a specialist in a team effort. Also allow for time in production scheduling so that the exposure to alternate ideas can still occur — throughout a project's course, not just at the end when it's too late to make substantial changes. Finally, realize that without such accommodations, a DAW presents the most efficient platform ever created for burning out producers.

The DAW is a powerful tool, but its power must be applied responsibly. Each station and each production team will have to weigh the DAW's advantages and drawbacks for itself. Without doubt, however, the DAW confronts the industry with a fundamental change in the creative process of audio production.

Steve Rowland is a Peabody award-winning radio producer based in Philadelphia.

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line is replaced, the original mix and processing can be recalled, allowing quick and efficient production of an alternate version.

This kind of production power was once the sole province of the most sophisticated and expensive studios, but it can now reside on every producer's desktop in a small, affordable and easy-to-use system.

IT'S A NON-LINEAR WORLD

The value of a DAW's non-linear storage methodology is clearly evident in its random-access capability during production, as exemplified in the preceding section. Yet, this architecture is also important in other ways.

Delivering the produced audio programs and spots from the DAW to the air is possible in an integrated fashion via file-based transfer over a LAN that connects the station's DAW(s) to a computer-based on-air delivery system. This same LAN can also connect several DAWs to each other for sharing of audio files or to a file server for access to a common audio library of sound effects and production music.

Two issues are critical in this interface: the speed of the LAN must be adequate (100Mb/s recommended) and the various computers and audio file formats involved must be compatible. A number of DAWs and digital radio automation manufacturers have built data bridges that allow such compatibility between their systems. File conversion routines and data entry screens allow a produced spot on the DAW to be easily transferred to the automation system for later automated airplay. Such delivery can even be accomplished between facilities or stations, using *wide area networks* (WANs), ISDN interconnections or to one of the previously mentioned digital audio distribution services.

This non-linear basis for radio program production and storage will also pay large dividends when a broadcaster moves toward provision of on-line audio services. Any interactive or "on-demand" delivery of audio programs via the Internet inherently requires a non-linear computer-based audio storage architecture. Unlike today's typical approach of stations dabbling with on-line audio by placing their air signals on the web, the real value of future Internet radio may come from on-demand access to streaming audio. This will allow a listener to request a program from a menu of offerings, and listen to it (with stop, rewind and fast-forward capabilities) immediately and in real time. If the station offering such service was not already producing and storing programming in a non-linear, computer-based fashion, interactive on-line audio service would not be feasible.

The capacity to produce radio programming in digital, non-linear form is here today in a cost-effective and user-friendly form — and not a moment too soon. The need for such capability has never been more critical to the survival and continued evolution of the radio industry.

FOR MORE INFORMATION
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Catching signals from the sky

Satellite receive antennas don't last forever, and their requirements are becoming more stringent.

BY JIM McEACHERN

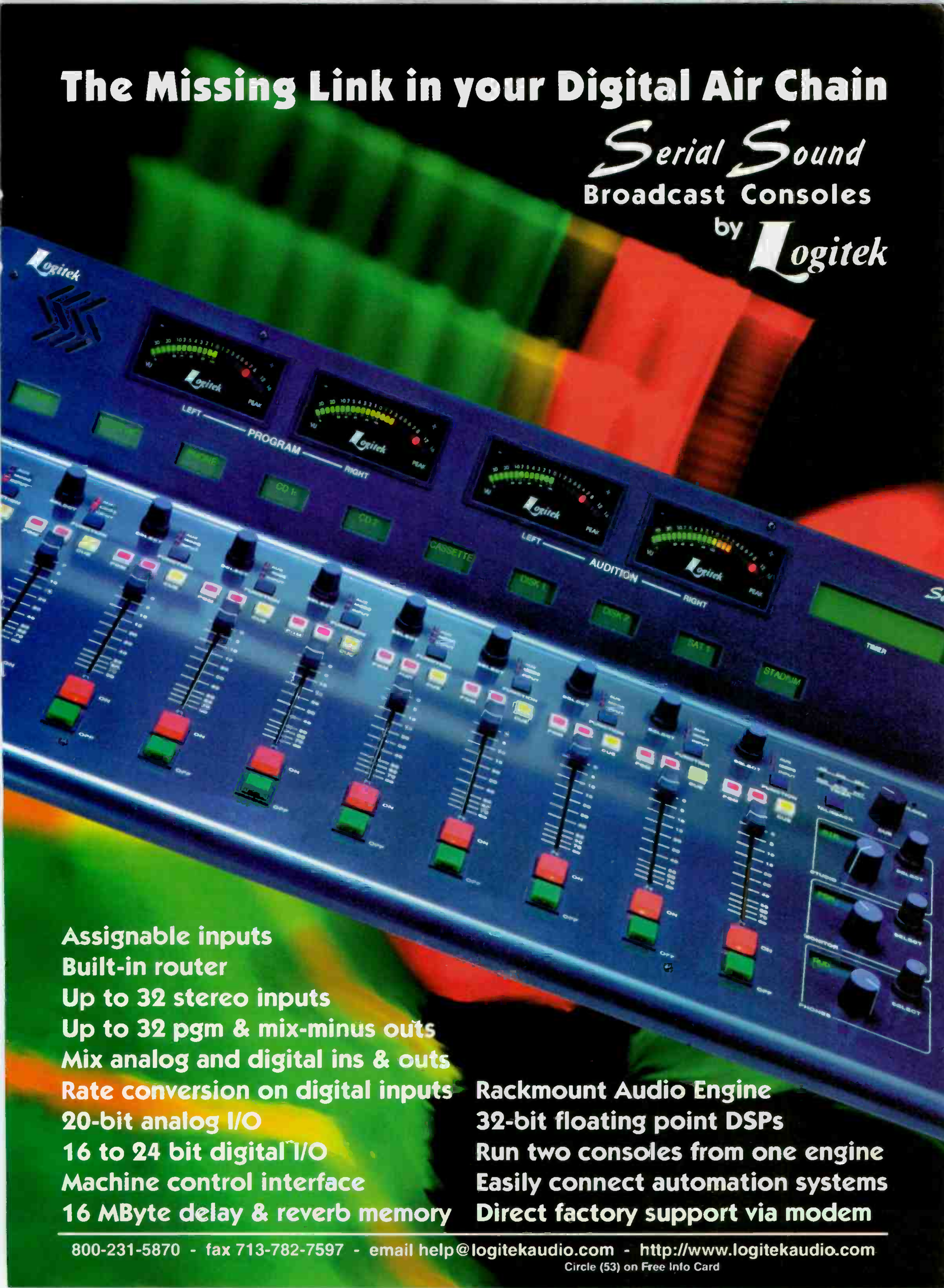
Radio stations equipping themselves for satellite reception use a number of criteria for antenna selection. The three most important factors to consider are: 1) antenna gain suitable for the station's location in the satellite footprint; 2) sidelobe performance; and 3) durability. Not surprisingly, however, a fourth factor — the cost of the antenna — often becomes the overriding issue in a station's antenna selection. Because of this emphasis on cost, the minimum required antenna gain has often been the sole engineering criterion used in antenna selection.

A lot has changed in the satellite environment, and these changes should be evaluated when replacing a dish or building a new facility.

SOME HISTORY

When audio distribution for radio broadcasting by satellite began in 1979, there were relatively few satellites in operation. Four-degree spacing between satellites was considered to be unusually close. As satellites replaced terrestrial distribution of video and data, the

Photo: Today's satellite antennas come in a wide variety of types and sizes — some are more appropriate for broadcast use than others.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number of geosynchronous satellites rapidly increased, and the spacing between them decreased.

In 1986, primarily at the behest of commercial video entities, the FCC adopted a rulemaking that permitted 2° spacing between satellites. At the same time, it placed the burden of interference avoidance in the 2° environment on the licensee or registrant operating a receive-only earth terminal. The FCC's terminology states that ". . .the actual level of any protection desired by an applicant from intersatellite interference for small receiving earth station antennas will be achieved by the choice of receiving antenna performance selected by parties installing new receive-only earth stations."

Today, the 2° spacing of the U.S. broadcast-satellite arc is essentially complete. A density of satellite signals that was once considered not feasible is now the norm.

At the same time that the spacing between satellites has decreased, the power-level differences between fully saturated video carriers and the *single-channel-per-carrier* (SCPC) signals often used for radio broadcasting have increased. For example, the amplifiers used for the transponders on Westar I in 1979 were rated at 5W output; today's Telstar 401 transponders are rated at 23W output — an increase of 6.6dB.

Finally, consider how polarization is used to increase each orbital position's effective bandwidth: Broadcast satellites use cross-polarized transponders that double each satellite's bandwidth and extend the frequency-reuse potential of the band (either C or Ku), with each satellite assigned a frequency plan that is cross-polarized from its 2°-spaced neighbors.

A density of satellite signals that was once considered not feasible is now the norm.

For example, in the C-band, transponder 3 on the Galaxy 4 satellite (99° W longitude) is *horizontally* polarized for downlink, while the same transponders (i.e., using the same downlink center frequency of 3,760MHz) on Galaxy 4's 2°-spaced neighbors' Telstar 401 and Spacenet 4 are *vertically* polarized. This implies that 4°-spaced satellites have co-polarized frequency plans. In this example, the same transponders on Galaxy 3R (at 95° W) and GE-1 (103° W) are *horizontally* polarized, providing similar RF characteristics to transponder 3 on Galaxy 4. (See Figure 1.)

This mode of operation, therefore, requires stations to carefully polarize their receive antennas in order to null out the unwanted co-frequency energy of opposite polarization that appears at 2° off-axis. It also places increased isolation-performance demands on the antenna, because of the co-frequency, *co-polarized* energy at 4° off-axis.

Catching signals from the sky

Some antennas are just not up to the task. Compromises made in those three basic antenna-selection criteria mentioned earlier may come back to haunt you.

ANTENNA GAIN

Most antennas sold to radio stations for C-band downlinks today have diameters between 2.4m and 3.8m (eight feet to 12 feet), with advertised gains between 37.5dBi and 42.9dBi. (The dBi is a unit used to quote gain referenced to an *isotropic* or non-directional antenna.) When purchasing a new antenna, make sure it has sufficient gain to deliver an adequate *carrier-to-noise ratio* (C/N) for analog operation or adequate *energy-per-bit above noise* (E_b/N_o) performance for digital operation.

For instance, a typical C-band digital SCPC audio system today has a system design goal with a worst-case E_b/N_o of 8dB. This provides a minimum operating margin of 4dB above the E_b/N_o of 4dB at which the system's audio encoding fails and the audio mutes.

Under today's conditions, if antenna gain is used as the sole antenna-selection criterion, the expected performance can approximate a "going downhill with a tail wind" environment. Remember that real-world conditions cause downlinks to cope with not only the *noise* in C/N or E_b/N_o, but also with *interference* — and the interference can be considerably greater than the noise. This is where the sidelobe performance of the antenna becomes so important in discriminating against the undesired signals from adjacent satellites.

ANTENNA SIDELOBE PERFORMANCE

Unfortunately, the FCC's "2°-compliant" antenna gain envelope (as specified in ¶25.209) doesn't offer much help, mainly because of the large power differences between SCPC and video transmissions. (See Figure 2.) While this envelope ($29 - 25\ \mathrm{Log}_{10}\Theta$) is defined in terms of absolute antenna gain for angles off the axis of the antenna, it doesn't take into account the *on-axis* gain of the antenna. The most significant factor in sidelobe rejection is the *difference* between the on-axis and off-axis gain at a specific angle, which the commission's specification does not adequately address.

To illustrate the problem, consider a commonly used 3.8m (12-foot) antenna with an advertised gain of 42.9dBi. Satellites with 2° spacing (which is measured from the center of the earth) appear to be about 2.2° apart when viewed from the earth's surface. The gain of an antenna meeting the FCC's "2° envelope" at 2.2° off-axis is 20.4dBi, which is 20.5dB less than the advertised on-axis gain of this particular antenna. At 4.4° off-axis, the "2° envelope" gain is 12.9dBi, which is 30dB less than the on-axis gain.

Assume that the antenna is aimed at the previously mentioned Galaxy 4, for reception of SCPC audio signals. Now consider that the saturated downlink power of a transponder on the 2° neighboring satellite Telstar 401 as measured in Washington, DC, is about

No manual required

but we'll send you one anyway

If traditional audio production is analogous to walking, a digital audio workstation is the equivalent to flying.

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Express is just one of three compatible software interfaces for Prisma — and editors are just a part of our product line. Turn to Spectral for an established company specializing in digital audio workstation and connectivity solutions. Call, fax, or e-mail for complete, detailed information on our practical approach to enhanced productivity and for a new tuna salad recipe.

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http://www.spectralinc.com
E-Mail: sales@spectralinc.com

SPECTRAL

Catching signals from the sky

39dBW EIRP (effective isotropic radiated power). As a paper exercise only, and assuming that this antenna follows the 2° gain envelope exactly, the power received from 2.2° off-axis would be the equivalent of 16.5dBW (39 – 20.5). Assuming that the downlink EIRP of the SCPC channel received on-axis by this antenna from Galaxy 4 is about 18dBW, on paper there is nearly equal energy being received by this antenna from both off- and on-axis.

In the case of satellites spaced 4° from the desired satellite, the off-axis energy received would be the equivalent of 9dBW (39–30). Any additional losses to the on-axis performance due to lower-power SCPC carriers, the use of smaller antennas with lower gain, mis-pointing, mis-polarization or the antenna not meeting its advertised specifications for one reason or another will worsen the discrepancy. Fortunately, most antennas in good condition display better performance than the examples above.

Finally, remember that in 2°-spaced situations, first-adjacent transponders are co-polarized. When these adjacent transponders are of widely divergent power levels, insoluble interference problems can occur. In this example, transponder 4 (centered at 3,780MHz) on Telstar 401 is used for video service. The ingress of such high-powered video signals into downlink antennas attempting to receive SCPC signals from Galaxy 4 on transponder 3 has rendered the upper 10MHz of transponder 3 unusable. In such cases, any protection afforded by "2°-compliant" antennas is rendered worthless.

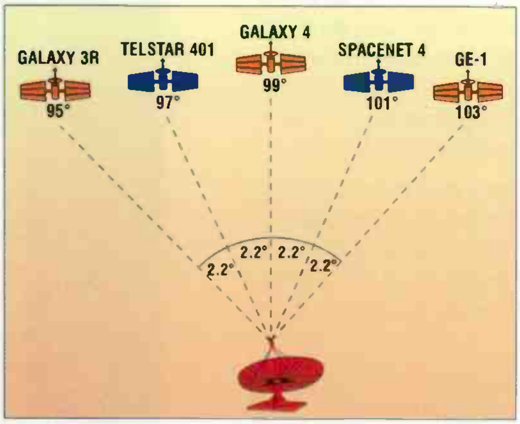


Figure 1. The central portion of the geostationary satellite orbit serving North America. Satellite locations are in degrees of West longitude (not drawn to scale).

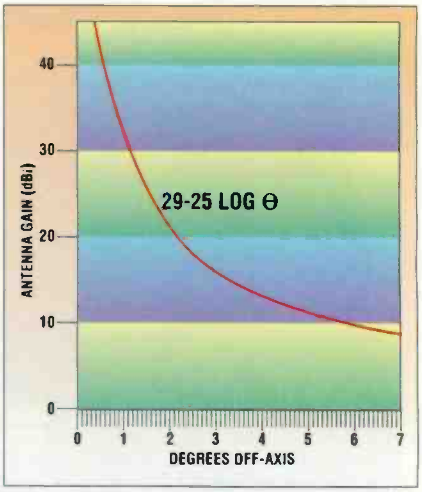


Figure 2. The FCC's "2°-compliant" antenna-gain envelope for downlink antennas (from ¶25.209).

Catching signals from the sky

POLARIZATION ALIGNMENT

Improper antenna polarization is the most common problem encountered by downlink antennas. While a certain degree of difficulty is created by many stations not having a spectrum analyzer readily available, more sites are mispolarized because of a misunderstanding of the principles of antenna polarization.

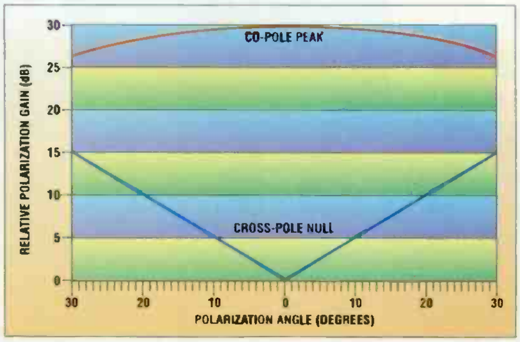
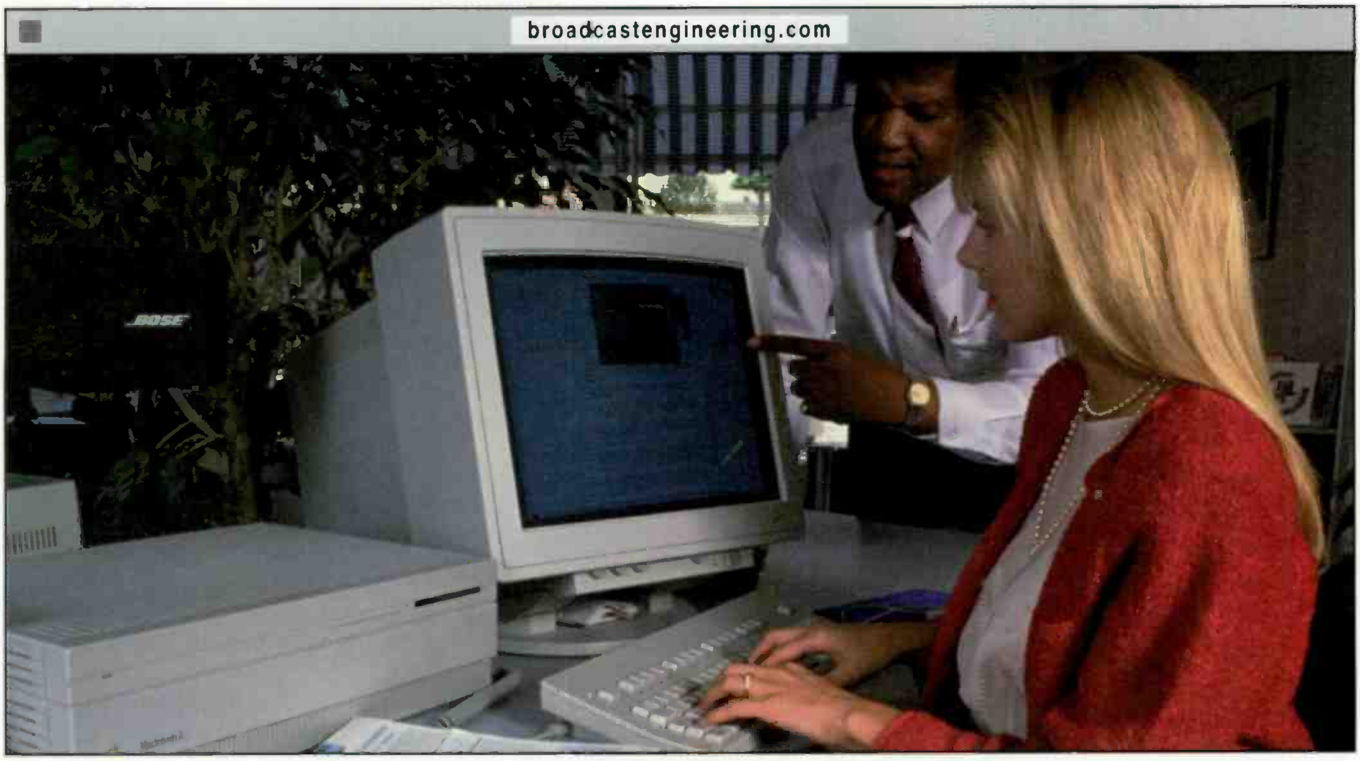


Figure 3. Polarization-gain characteristics of peaking the desired signal vs. nulling a cross-polarized signal. Note how the nulling curve defines its minimum value more critically than the peaking curve defines its maximum value.

Successful antenna polarization is not achieved by peaking the received level of the desired transponder's signals, but rather by nulling the undesired signals from the cross-polarized transponders on the same satellite. As Figure 3 demonstrates, when peaking for maximum signal strength, a fair amount of rotation of the low-noise amplifier (LNA) is required to achieve a relatively small increase in the desired signal level, while a *small* amount of LNA rotation is required to achieve a sharp null of the undesired signal. This gives the nulling process a far higher resolution than the peaking process, rendering the nulling process more successful in achieving accurate polarization of the antenna.

In the previous example of Galaxy 4, the essentially co-polar interference from satellites 2° adjacent (Telstar 401 and Spacenet 4) is centered at the edges of the transponders, at intermediate frequencies (IFs) near 50MHz and 90MHz. Because there are satellites on both sides of Galaxy 4, their energy combines. Because the polarization frequency plans for satellites separated by 4° are the same, the combined energy received from Galaxy 3R and GE-1 in this example will be centered near 70MHz IF — right in the middle of the transponders.

Adjusting polarization of a receive antenna to null out the signals from normal of the satellites at 2° or 4° spacing on *one* side of a satellite could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BOSE

Catching signals from the sky

create a *worse* cross-pole interference situation with signals from the satellites on the other side. You must also consider what's on the adjacent transponders of the same satellite at which the antenna is pointed. In this example, cross-polarized video is on transponder 2 of Galaxy 4, so optimizing for the best cross-pole isolation on Galaxy 4 itself turns out to be the most critical process required.

ANTENNA DURABILITY

In an ideal world where money is no object, everyone would specify large antennas that are built like battleships. The conversion of many satellite networks from analog to digital transmission in recent years has uncovered a number of problems with stations' receive antennas. These problems were previously masked by the relatively forgiving failure mode of analog systems, but they are now painfully apparent due to the far more absolute failure mode (the "cliff effect") of digital systems.

Although some of these problems have been due to electronic shortcomings, such as out-of-spec downconverter phase-noise or frequency translations, reports of antenna-related difficulties are on the rise. Deficiencies in antenna durability seem to be at the root of many such problems, both for fiber-glass and perforated-metal antennas. Problems have not yet been reported for substantial solid metal reflectors.

When troubleshooting these antenna-related problems, ingress of inter- and intrasatellite interference is fairly obvious, and has been the immediate cause of many recent impairments. Repointing and polarization of receive antennas has improved the performance, but it hasn't always cured the problems. In those cases where problems persisted, visual observation and measurement of the reflectors revealed that reflectors were warped, squinting or out-of-round. Movement of the edges of the reflector in some cases increased the antenna's gain, even though the pointing and polarization had been previously optimized. In short, it appears as though a "relaxation" of the antenna reflector's original shape had occurred. As the

Uplink control rooms like this one at Chicago International Teleport handle many reports of reception difficulties, but they can't do much when the problem comes from a downlink's receive antenna.

reflector's focus changes, the antenna's on-axis gain and sidelobe rejection decrease as its directivity deteriorates.

This reflector-shape problem appears to be more a function of the number of years in service than anything else. Antennas that have been protected from wind and blown debris seem to do better than those that are totally exposed to the elements, such as those in a roof-mount situation. Some fiber-glass antennas are also suffering from delamination and chipping of the reflective surface, which can contribute to such problems.

Fiber-glass technology has improved significantly since the early 1980s when many of these antennas were installed. Several different methods are used in the manufacture of reflectors relating to the internal framing and bracing. Clearly some manufacturers do a better job than others.

Light-metal and mesh dishes seem to be particularly prone to "dent tuning," displaying large and small dimples (both convex and concave) that seem to be caused by weather — primarily hail and heavy snow loads — as well as by human contact. Some of the lighter-weight mesh reflectors are quite malleable and appear to have close relatives in the lawn-furniture industry.

If you have doubts about your reflector, eye-balling is the easiest check of its condition. Sight along the plane of the reflector lip closest to you and make sure the plane of the opposite side is parallel to it. Perform this check from at least two different angles. Another check requires a bit more work, but it gives a better indication of the reflector's shape: Stretch two strings across diameters of the reflector perpendicular to each other. The strings should just touch each other at the point where they cross. If there is more than about an inch of space between them, your reflector may be beginning to sag.

DISH-SHOPPERS TAKE NOTE

The two most obvious conclusions that can be drawn are: 1) You get what you pay for; and 2) Satellite antennas have a finite usable life, which is probably directly proportional to the purchase price.

Most antennas displaying these problems have been in service for 10 or more years and have been installed in environments exposed to the full force of the weather. Although manufacturers may claim that their antennas will last forever, experience is proving this to be overstated.

A reasonable lifetime for this type of antenna is around 10 years. In terms of cost-effectiveness, a station would still be money ahead if it bought two $3,000 antennas over a 20-year period instead of one $12,000 "battleship." Stations' priorities regarding engineering practices, quality concerns, the nuisance factor of changing antennas periodically, possible facilities moves, and perhaps most importantly, the station's budget, must all be considered. Trade-offs may be required in each station's decision-making.

Experience has proved that either retiring or attributing a finite lifetime to a piece of equipment in radio is difficult at best. First things have traditionally come first, and the available dollars are generally applied to the hottest fire or the shortest fuse. There's usually plenty of other equipment in a station that needs to be replaced and/or upgraded before the satellite antenna makes it to the short capital-funds list. Yet, in taking a long-range view, a $3,000 antenna that provides 10 years of adequate service costs a station about $1.25/day, which seems to be a reasonable investment.

The ultimate question is, "How important to your station's sound and schedule is the program material received from the satellite system?" If your antenna's performance cannot be optimized through pointing and polarization to provide the required reliability and signal quality, it may be time to think about replacing it. If it must be replaced, don't shortchange yourself by specifying an antenna solely on size or financial criteria. Pick an antenna that will give you the best adjacent satellite isolation and durability for the dollar.

Jim McEachern is director of operations and engineering for National Public Radio's Distribution Division, Washington, DC.

Photos courtesy of Spacecom Systems, Tulsa, OK.

FOR MORE INFORMATION
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Business/ People

BUSINESS

Comrex, Acton, MA, was selected by **SportsAmerica Radio** to provide equipment linking its studios around the country to its home studio, located at the "Field of Dreams" in Dyersville, IA. Pictured (from left to right) are the participants in a remote broadcast delivered to the home studio from Scottsdale, AZ: Mike Elliot (talk-show host), Darrel Evans (former major league baseball player) and Charlie Jones (talk-show talent).

SYPHA recently released "The Internet for Broadcasters," a resource book containing technology and management articles, case studies and a directory of Internet resources, as well as web sites and E-mail addresses for more than 500 equipment suppliers, services, information sources and organizations. Contact SYPHA at: +44 181 761 1042; fax: +44-181-244-8758; 100256.377@compuserve.com or www.mandy.com/2/sypha.

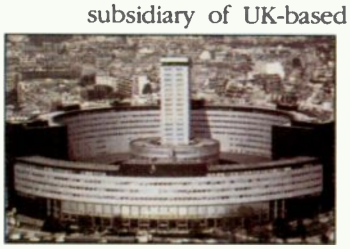
360 Systems, Westlake Village, CA, installed seven Instant Replay hard-disk audio players at the **TIC Radio Network**, Marshfield, MA.

Digital Courier International, Vancouver, BC, and **Cycle Sat, Inc.**, Burbank, CA, formed a strategic alliance to offer clients the benefits of an advanced digital audio network, including two-way service, confidentiality, one-hour delivery service and delivery confirmation.

The **Test Instruments Division of Neutrik AG**, Liechtenstein and **Cortex Electronic**, Germany, have merged their activities to form **Neutrik Cortex Instrument Group** (NCI).

Crown International, Elkhart, IN, celebrates its 50th anniversary in 1997.

SADiE GmbH, the European distribution and support subsidiary of UK-based **Studio Audio & Video Ltd.**, announced several recent sales. Radio France installed 15 SADiE disk-editing systems, while Talk Radio became the 32nd UK commercial radio station to install a SADiE disk editor. In addition, SADiE sales to the BBC topped 400 as BBC Radio 1 specified that all four of its new studios will be SADiE-equipped.



Amplifonix, Inc., Philadelphia, purchased the **Fidelipac Corporation**, Moorestown, NJ. Fidelipac will continue to serve the industry as a division of Amplifonix.

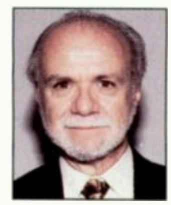
GEPCO, Chicago, donated thousands of feet of cable to the construction of the studio at the Radio Hall of Fame in Chicago. The studio is now in operation and home to a number of regular broadcasts and special events.

NEW WEB SITES ANNOUNCED:

Audio Processing Technology (APT)	www.aptx.com
Russ Berger Design Group	www.rbdg.com
Aphex Systems	www.aphexsys.com
Pacific Research & Engineering	www.pre.com
Caig Laboratories	www.caig.com

People

Keith McMillen was appointed director of engineering for Orban, San Leandro, CA.



Nick Balsamo was named director of Eastern regional sales for Studer Professional Audio, Murfreesboro, TN.

Matt Meaney was named systems integration manager for Broadcast Programming, Seattle.

Stuart McRae was hired as sales manager for the southern region and **Bryan Jones** was promoted to sales manager for the central region at Broadcast Electronics, Quincy, IL.

Michael Cantwell was named vice president and chief financial officer of Quantegy, Inc., Peachtree City, GA.

Chrissie McDaniel was appointed sales and marketing manager for Aphex Systems, Sun Valley, CA.

Sandy Berenics and **Martin Sacks** joined Pacific Research & Engineering Corporation, Carlsbad, CA, as account executives in major market sales in the Midwestern and Eastern regions of the United States.

Bruce W. Johnson was named president and chief operating officer of Richardson Electronics, LaFox, IL. Additionally, Johnson was elected to the board of directors.

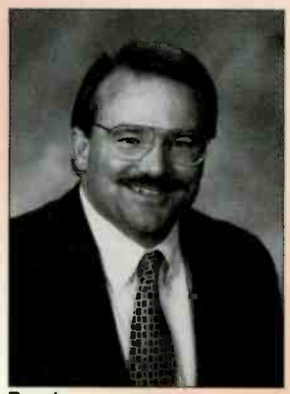
Clayton L. McMillan was appointed broadcast sales engineer for Gentner Communications Corporation, Salt Lake City.

News

Plane crash claims three broadcast equipment executives

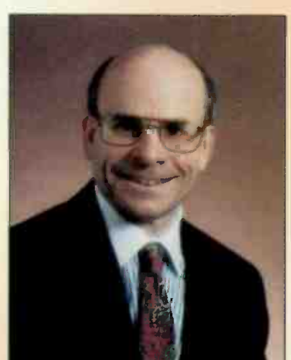
A runway collision at the Quincy, IL, airport on Nov. 19, 1996, claimed the lives of three prominent men in the broadcast equipment industry. They were among 14 passengers and crew killed in the accident, which involved a private plane and a commuter aircraft.

Dennis Reed, 37, was director of international programs for Harris Corporation's broadcast division. James Beville, 50, was president of Dielectric Communications Company, Raymond, ME. Mark DeSalle, 43, was Dielectric's vice president of finance. All three were on their way to business meetings at Harris Broadcast's headquarters in Quincy. Their commuter flight had just landed when it collided with the private plane at a runway intersection.



Reed

Reed had recently moved to Harris Broadcast's systems division in Florence, KY, after 13 years with the company's RF communications division in Rochester, NY. He is survived by his wife, a son and a daughter. A trust fund has been established for Reed's children. Contributions may be sent c/o Chris Keys, Canandaigua National Bank and Trust, 61 W. Main St., Victor, NY 14564.



Beville

Prior to his position at Dielectric, Beville had managed the communications product group at Thermo Electron and had worked at General Signal, now the corporate parent of Dielectric. He is survived by his wife and three sons.

DeSalle

DeSalle had worked in the financial department at Dielectric since 1979. He is survived by his wife and a son. A scholarship fund has been established by Dielectric in memory of Beville and DeSalle. Contributions may be sent to Dielectric Memorial Fund, c/o Peter Fitch, Dielectric Communications, 22 Tower Rd., Raymond, ME 04071.

New Products FROM AES

Detangler
Z-Systems

▶ **z-64.64r Digital Detangler Pro:** A switcher designed to work with digital audio signals (AES/EBU & S/PDIF) that is an automated patchbay, router and distribution amplifier in one package. It features 64 AES/EBU stereo pairs in and out providing the power to physically interconnect digital audio workstations, CD players, A/D and D/A converters, MDMs, signal processors and DAT machines in the digital domain.

Also from Z-Systems — An upgrade to the **z-q1** and **z-q1m** stereo digital parametric equalizers that enables them to support the new studio reference standard of 24-bit samples at sampling rates up to 96kHz.

352-371-0990; fax 352-371-0093; z-sys@z-sys.com; www.z-sys.com
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Microphone
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◀ **MD421 II:** A cardioid, dynamic microphone that incorporates all the characteristics of its predecessor, the MD421, with several improvements. The faster, more open and transparent MD421 II combines advanced materials and modern manufacturing techniques making it a more rugged microphone that is less sensitive to dust and humidity.

Also from Sennheiser — The **MD425** supercardioid, dynamic microphone features excellent directionality and feedback suppression, as well as superior noise rejection. A close-miking effect makes it ideal for situations that require multiple microphones.

860-434-9190; fax 860-434-1759; www.sennheiserusa.com
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Cable
Gepco

▶ **4200 series:** An upgrade to the 618 series, this multi-pair audio cable features 22-gauge stranded, tinned copper conductors with tight stranding on the conductors and drain wire that provides flexibility while reducing strand fraying. The foil of the 4200 series is bonded to the pair jacket so both can be stripped in one easy motion.

312-733-9555; fax 312-733-6416
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Transceiver
Audio Processing Technology

• **BCF 256:** A broadcast network transceiver designed to deliver FM-quality stereo digital audio at 15kHz over permanent links, such as STLs and permanent studio networks. If the system is linked to an external terminal adapter, an integral ISDN backup automatically maintains essential links should the regular connection fail.

Also from APT — The **SBL 128/256** wireless digital audio codecs are capable of operating up to 48km.

+44 (0) 1232 371110; fax +44 (0) 1232 371137; www.aptx.com
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▲ **1029A:** A compact close-field system featuring a high degree of accuracy and exceptionally wide dynamic range, incorporating Genelec's proprietary Directivity Control Waveguide technology. In addition to extremely low harmonic distortion, the 1029A features a front-mounted volume control and rear-panel bass and treble response controls.

Also from Genelec — The **1091A** subwoofer is expressly designed for use in conjunction with the Genelec 1029A monitors.

508-440-7520; fax 508-440-7521; www.genelec.com
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◀ **CD-R pen:** A fine-point black marker for writing on CDs that doesn't reduce the life of the disc because of its permanent, but not solvent-based, ink. It works with any recordable CD and on many other surfaces.

Also from Apogee Electronics — The **CD•R**, a recordable CD, is optimized for audio and offers quality and longevity with its gold 'Pthalocyanine' dye and DataSaver resin layer. The recordable CD is available in a 74- or 63-minute format.

310-915-1000; fax 310-391-6262; info@apogeedigital.com; www.apogeedigital.com/
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New Products FROM AES

Oscilloscopes

Tektronix

▶ **TDS 200 eries:** A line of low-cost, high-performance digital real-time oscilloscopes designed for manufacturing, education and service applications. It features low price, superior measurement capability, unique compact size, and analog-like controls and operating modes. The models sample at 1GS/s, allowing users to capture signal details invisible on analog scopes. Its pre-programmed automatic measurements allow users to quickly quantify waveforms.

800-479-4490
Circle (157) on Free Info Card

CD player

Sony

◀ **CDP-D500:** This CD player is designed for use in a wide range of applications and offers compatibility with many different recording devices because of its digital out and analog out audio interface. Parallel and serial ports are included in its remote control interface. Some features include variable cue/shuttle knob, +/-12.5% varispeed control capability and word sync input.

Also from Sony — The **CDP-XE500** CD player suppresses distortion by combining outputs from four separate converters. Its digital volume control operates with increased stability and repeatability. The **PCM-R500 DAT** recorder features Super Bit Mapping (SBM) technology and a four-direct drive motor transport mechanism. The unit also includes a two-mode DIN eight-pin remote. The **MDS-B5** stereo MiniDisc Cart recorder uses ATRAC technology for its high-speed duplication and multi access memory "Hot" start. The recorder also provides a remote and IBM keyboard interface and full function RS-232C interface.

1-800-635-SONY; fax 1-800-SONY-022
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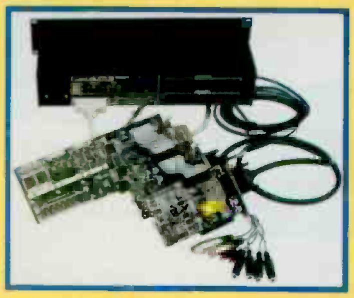
Workstation system

Digital Audio Labs, Inc.



▶ **V8:** A multitrack digital audio workstation system for PC compatibles that provides a main board with an upgradable DSP architecture and a variety of input and output options. It records and plays up to 16 discrete tracks depending on the system throughput and features an automated mixing architecture and flexible patching and routing matrix.

612-559-9098; fax 612-559-0124
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Small-format tape

Quantegy

◀ **Small-format recording systems:** A tape product designed to meet the needs of digital ADAT, DTRS, DAT and analog cassette systems. The 489 products offer 42-minute and 60-minute S-VHS formulations for the digital ADAT multitrack format. The DA8 is an advanced metal particle 8mm tape formulated for the specific needs of the DTRS digital multitrack format.

770-486-2800; fax 770-486-2808
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14. Issue Date for Circulation Data Below: July/August 1996.

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A. Total No. of Copies Printed (Net Press Run)	14,879	13,962
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1. Sales through dealers and carriers, street vendors and counter sales	0	0
2. Paid or Requested Mail Subscriptions	12,528	12,522
C. Total Paid and/or Requested Circulation	12,528	12,522
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Visit HHB on line at: http://www.hhb.co.uk

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New Products FROM AES

CD recorder
Studer

▶ **D741:** This CD recorder includes analog I/O, AES/EBU and S/PDIF digital interfacing and a standard SCSI-2 interface. A built-in sample-rate converter allows the digital inputs to accept signals at any sample rate between 32kHz and 48kHz, while on the analog side, individual left and right gain controls are provided for uncalibrated operation, plus a calibrated mode for use with fixed studio levels. It can be operated from the front panel, while monitoring can be carried out on headphones or on the built-in monitor speakers.

Also from Studer — The **On-air 2000** digital audio console is specifically designed as an on-air mixing console for radio, television and other broadcasting applications. The fully digital mixer is ergonomically designed to interface easily with any type of radio broadcast environment.

615-399-2199; fax 615-367-9046; rclyne@musicpro.com; www.musicpro-com/
Circle (165) on Free Info Card

Maximizer
TC Electronic

▲ **DBMAX:** A digital broadcast maximizer performs as a transmission processor and as a mastering tool. In outside broadcasting, the DBMAX controls problem frequencies with selective dynamic equalization. Optimized broadcast-specific presets include commercials, talk shows, news and all music types. The versatile multiband dynamics processor includes EQ, stereo adjust, three-band compressor, limiter and more.

805-373-1828; fax 805-379-2648; tcelectr@inet.uni-c.dk
Circle (166) on Free Info Card

User-interface software
Spectral, Inc.

▲ **Express:** A software user-interface for Spectral's Prisma digital audio workstation hardware that uses a menuless editing interface designed for radio broadcast applications. All common editing tools are on a single screen panel, and powerful tools, such as normalization and one-touch submix, are included. It also supports direct file transfer to several popular digital on-air delivery systems.

206-487-2931; fax 206-487-3431; sales@spectralinc.com; www.spectralinc.com
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New Products FROM AES

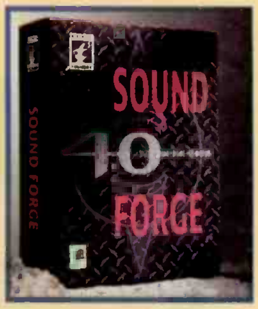
Codec/mixer
Musicam USA

•**RoadRunner:** This compact portable ISDN codec/mixer sends and receives mono audio over phone lines. It provides digital frequency response to 20kHz and comes with mic- and line-level mixing inputs. The unit is bidirectional with built-in terminal adapter for use at 56, 64, 112 and 128kb/s with Layer II, III or G.722 algorithms.

Also from Musicam USA — The portable **Olympian** codec/mixer offers contribution-quality bidirectional digital stereo audio. It supports Layer II up to 384kb/s, and Layer III to 320kb/s. In addition, built-in intelligence automatically performs critical functions.

908-739-5600; fax 908-739-1818; roadrunner (or olympian)@musicamusa.com; www.musicamusa.com
Circle (168) on Free Info Card

Sound editing software
Sonic Foundry



▶ **Sound Forge 4.0:** The updated version of this software features seamless support for ActiveX audio plug-ins, RealAudio 3.0, a preset manager, non-destructive cutlist, and more. This free update is available on Sonic Foundry's web site.

Also from Sonic Foundry — **CD-Architect Plug-In** provides support for PQ editing, including track times, subindices, ISRC codes and more. It also writes Redbook audio to a recordable CD and can read Redbook audio directly from CDs. The **Acoustics Modeler Plug-In** incorporates acoustical responses of a given environment onto a sound file. The plug-in includes an extensive library of high-quality acoustic signatures while providing users with the ability to collect and save their own signatures.

800-577-6642 or 608-256-3133; fax 608-256-7300; sales@sfoundry.com; www.sfoundry.com
Circle (169) on Free Info Card

Turnkey system
Equi=Tech

◀ **Balanced Power AC systems:** A turnkey system for hardwired installations in facilities requiring 5kVA or more of technical power. Based on toroidal isolation transformer design, the system eliminates noise caused by AC power supply transients and interference. Wall units come in three sizes.

541-597-4448; fax 541-597-4099; www.equitech.com
Circle (170) on Free Info Card

Software
Digidesign

▶ **Pro Tools 4.0:** A software with new automated mixing features that offer a familiar work surface of physical faders, buttons and knobs. Full dynamic automation of all parameters includes gain, pan and sends/returns. It also includes a new plug-in architecture called AudioSuite with several file-based processing modules. AudioSuite is an "open" specification, allowing the number of plug-ins to grow. Other features include edit during playback, support for all major file formats and bit depths, finder-style searching and sorting in region list, and multiple edit playlists per track.

Also from Digidesign/QSound Labs — **i-Media Audio** plug-in offers users high fidelity audio compression at the widest range of compression levels. The plug-in enables real-time, studio-quality audio encoding from a live or recorded audio source on a multimedia computer without the need for compression hardware. Another plug-in for Pro Tools, **QSYS/TDM** from QSound Labs is a 3-D audio localization plug-in with the ability to place up to four independent mono audio channels in specific static or dynamic positions within an enhanced stereo soundfield.

415-842-7900; www.digidesign.com
Circle (171) on Free Info Card

Software
Studio Audio and Video Ltd.

◀ **SADiE3:** This free upgrade to existing users is a complete re-write of the existing SADiE software. Its Dynamic Reallocation of DSP power enhances the system efficiency, allowing more streams for playlist editing and unlimited virtual streams. Its Audio Format Interchange enables the system to read and write most major audio formats. Waveform profiles are displayed and edited in the playlist while scrub and jog functions enable accurate positioning when working to picture.

Also from Studio Audio and Video Ltd. — **SASCiA**, a real-time network, is capable of transferring multiple channels of digital audio between SADiE and Octavia workstations. This ATM peer-to-peer network allows groups of SADiE systems to share common disk drives.

44-0-1353-648888; fax 44-0-1353-648867
Circle (172) on Free Info Card

Circle (23) on Free Info Card

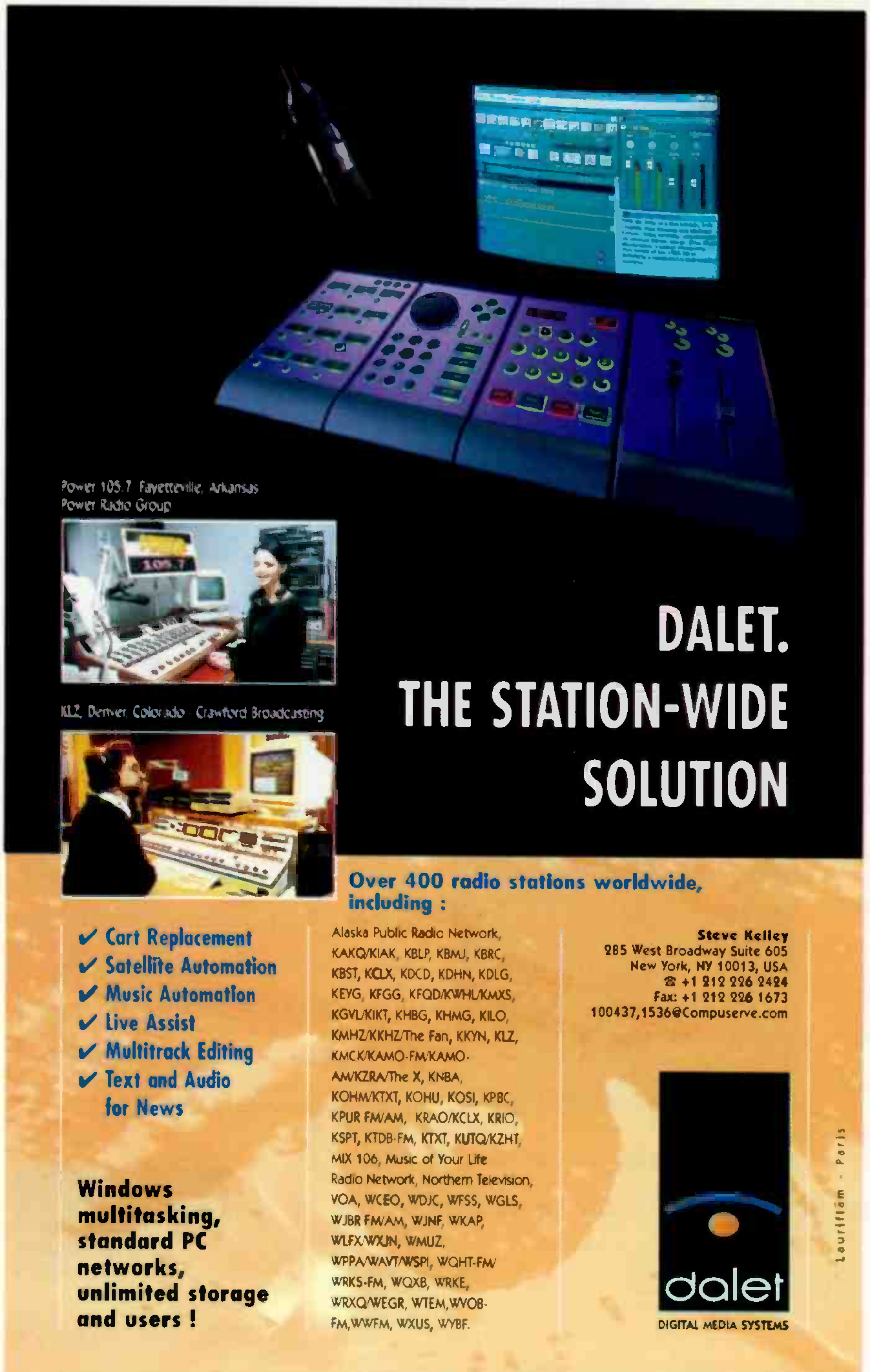
New Products FROM AES

DAT recorder

Panasonic

▶ **SV-3800:** A DAT recorder with new technology that enhances sound quality and functionality. Featuring 20-bit resolution DACs with one-bit, 64 times oversampling A-D converter, the unit accents its user-friendly controls and operational processes with its ergonomic design and front-panel selectable features. Its Single Program Play function is ideal for post-production, broadcast and stage applications.

714-373-7277; fax 714-373-7903
Circle (173) on Free Info Card



Processing system

Waves Ltd.

• **Native Power Pack:** A pro audio system of software that uses native processing within the computer. This complete effects processing solution makes records, creates multimedia titles, authors audio for the Internet, and designs sounds for games or records at home. It contains True-Verb virtual-space reverb, C1-compressor and C1-gate, S1-stereo imager and L1-ultramaximizer mastering peak limiter.

Also from Waves Ltd. — **TracPac**, a drag-and-drop audio utility for compressing audio files, is ideal for archiving audio files to conserve disk space or for Internet file transfer. By expanding the file back to its identical original state, TracPac offers true audio file compression down to 50% or more on 16-bit sound and down to 20-30% of the source file on eight-bit material.

423-689-5395; fax 423-688-4262;
waves@waves.com; www.waves.com
Circle (174) on Free Info Card

Command station

JLCooper Electronics

• **MCS-3000:** A media command station that provides direct control of digital workstations and recording systems for music and video production and post-production. Features include motorized faders, 60 programmable function keys, five rotary encoders, transport controls and more. It also stores 100 locate points and has built-in SMPTE/EBU and MIDI time-code readers. The MIDI I/O ports and two expansion slots allow optional interface cards for extended control capability.

310-306-4131; fax 310-822-2252;
75300.1373@compuserve.com
Circle (175) on Free Info Card

Equalizer

Night Technologies International

• **EQ3-D:** A dimensional equalizer includes circuitry that guards against phase shift and resulting distortion. This six-band, two-channel equalizer is a true stereo system with total channel-independent electronics and filters. AirBand, a high-frequency, boost-only shelf, adds a high-end presence or dimension to the signal for a "live" like sound.

801-375-9288; fax 801-375-9286
Circle (176) on Free Info Card

Active speaker system
HHB Communications/ATC Loudspeaker Technology

▶ **SCM20A:** An active two-way speaker system manufactured by ATC Loudspeaker Technology and distributed by HHB Communications. The system features an integrated carry handle and universal omnimount fixings for flying or wall mount. Housed in a die cast aluminum cabinet, it provides a bass amplifier with 220W rms with a treble amplifier offering 50W rms.

Also from HHB Communications/ Genex — HHB Communications is the exclusive distributor for the **Genex GX8000** digital recorder that offers eight-track recording and playback on removable MO disks. The unit can record up to four tracks simultaneously at a sampling rate of 96kHz.

207-773-2424; fax 207-773-2422; 75671.3316@compuserve.com
Circle (180) on Free Info Card

Signal processor
Crane Song

▶ **HEDD:** A digital signal processor engineered to be musically transparent while providing the capability of generating tube/analog sounds in the digital domain. Applications include CD preparation, workstation input and output, DAT machine A/D and D/A converter replacement and effects generation. Other features include adjustable triode and pentode sounds, accurate digital meter, external sync inputs and 24-bit processing.

715-398-3627; fax 715-398-3279
Circle (178) on Free Info Card

Workstation
Merging Technologies

• **Pyramix Virtual Studio:** This digital audio workstation system uses the Kefren DSP audio processor board, which is a specialized audio processor for personal computers and workstations, and Open Media Framework Interchange (OMF) to ensure compatibility with other leading audio and video workstations. A core effects group includes four-band parametric EQ, 10-band graphic EQ, three-band tone control, comprehensive dynamics with noise gate, expander and more. Both four- and eight-channel configurations are available.

Also from Merging Technologies — **LRC**, a lossless real-time coding system, offers lossless and real-time compression for digital audio datastreams. Depending on the audio source material, the system provides data compression ratios of more than 3:1 in real time to increase media storage and track capacities, and to provide faster backup and archiving for digital audio workstations.

619-675-9703; fax 619-675-2247; info@merging.com; www.merging.com
Circle (179) on Free Info Card

New Products FROM AES

XLR chassis connectors
Neutrik

▶**"A" and "B" series:** These XLR receptacles offer small size with high panel density and fast fixing to chassis with self-tapping screws. A new reliable "tuning fork" contact principle makes all contacts completely hard-gold plated.

Also from Neutrik — The **Z series** is the latest in cable XLR connectors available in solder or Mil-Crimp versions. A new locking mechanism on the female mechanism provides a solid coaxial and noiseless link to the mating male connector or to a microphone.

908-901-9488; fax 908-901-9608
Circle (164) on Free Info Card

Digital recording console
Yamaha Corporation of America

▲ **03D:** A digital recording console based on the 02R offers 26 inputs, four buses plus stereo bus output, 16 direct outputs, six aux sends and two internal effect processors. The console interfaces with digital multichannel devices via digital interface cards. A built-in computer operates console automation when interfaced with an outside time-code source. New features include LCRS surround-sound capabilities and RS-422 control interface to edit controllers.

Also from Yamaha — The **MD4** digital multitrack recorder, designed for musicians seeking professional sonic performance, uses the Mini Disc data format for four-track recording. It features audio editing capability and a removable recording disc.

714-522-9011; fax: 714-739-2680; Info@Yamaha.com; www.yamaha.com
Circle (159) on Free Info Card

Microphones

AKG Acoustics

◀ **Emotion series:** A line of low-cost, high-performance microphones designed specifically for live-performance applications. It uses both "Tiefzieh Varimotion Technology," a process that allows diaphragms to reach tolerances before associated only with the most expensive studio microphones, and "Doubleflex" technology, a two-way elastic suspension system that mechanically isolates the microphone capsule and reduces handling noise.

Also from AKG — The **CK 69-ULS** microphone works well in near and far field situations with its two-part interference tube. When used with the C 480B pre-amp, the CK 69-ULS provides ultralinear frequency response, transfer characteristics, low noise and high sensitivity. The 48V-only pre-amp features a built-in switch that allows the gain to be increased by +6dB or preattenuated by 10dB.

615-399-2199; fax 615-367-9046
Circle (161) on Free Info Card

Miniature microphone

Bruel & Kjaer

◀ **DPA4060:** A miniature microphone that can be mounted directly on the body with a newly designed 5.4mm prepolarized condenser cartridge. Two protection grids provide acoustical equalization and are cleaned easily with alcohol.

519-745-1158; fax 519-745-2364
Circle (163) on Free Info Card

New Products

On-line UPS systems
MGE UPS Systems

▶ **Pulsar EX15:** This on-line double conversion uninterruptible power supply incorporates an array of features designed to optimize performance and reliability. It is designed specifically to provide reliable power backup to sensitive, critical equipment. Some key features include true sinewave output, built-in bypass, and automatic UPS and battery test.

714-557-1636; fax 714-434-7652; www.mgeups.com
Circle (188) on Free Info Card

Digital mixer
Audio Design/HHB

• **DMM-1:** A compact four-channel digital mixer designed for specialized applications, such as DAT editing and dubbing, as well as copying and dubbing digital audio for video. HHB is the exclusive distributor for the product.

207-773-2424; fax 207-773-2422;
75671.3316@compuserve.com
Circle (187) on Free Info Card

Punch block interfaces
Leitch

▶ **ADC punch block interfaces:** Interfaces for audio routers and audio distribution amplifiers that offer quick interconnects. The interfaces come prewired with umbilical cord and D25 connectors for plug-in to equipment frames. The audio router interfaces each provide 16 input or output connections. Up to eight interface modules will fit in a three-rack unit supplying up to a 32x32 routing system.

800-231-9673; fax 757-548-4088
Circle (189) on Free Info Card

Amplifier
Crown International

▶ **K2:** The first amplifier to use Crown's proprietary Balanced Current Amplifier (BCA) circuitry to deliver high power while generating virtually no component-degrading heat. The K2 generates one-tenth the heat of conventional amplifiers and is more than three times more thermally efficient than other amplifiers on the market. Its output is 2,500W (1,250 W/ch into 2Ω) and its efficiency allows more amplifiers to be plugged into a single AC circuit.

800-294-8050 or 219-294-8050; fax 219-294-8222; jblum@crownintl.com;
www.crownintl.com
Circle (182) on Free Info Card

Orban-made DDS systems available

Orban

▶ **DDS Systems:** Production of the computer-based Digital Delivery System (DDS) for broadcast audio has resumed with all product development and manufacturing now fully integrated into Orban's California facility. As a result of Orban's acquisition, the DDS software has been refined with Orban's software methodology from the DSE 7000 DAW. Designed primarily for on-air radio applications, DDS combines user-friendly analog-style operator interfaces with the power, efficiency and audio quality of an all-digital system. It may be configured for multiple station operation in automation, live assist or any combination of the two.

510-351-3500; fax 510-352-0500; amyhuso@orban.com
Circle (181) on Free Info Card

Microwave monitor

Holaday Industries

• **HI-3510:** A personal microwave monitor designed to detect and alert the wearer to potentially harmful levels of electromagnetic radiation. The HI-3510 can detect non-ionizing radiation from RF and microwave sources in the frequency range of 50MHz to 1.2GHz. The measurements are displayed on a three-digit LCD readout and a 10-segment bar graph, which is normalized to the selected alarm warning level, and aids in obtaining a quick visual determination of the hazard level.

612-934-4920; fax 612-934-3604
Circle (184) on Free Info Card

On-air broadcast console

Pacific Research & Engineering

▶ **AirWave:** This on-air broadcast console is targeted specifically at medium- to smaller-market stations. AirWave comes as a mainframe with the number of channels to be determined by the customer. Some of the standard features include a unique pre-amplifier module that contains five high-performance microphone pre-amplifiers with phantom power; balanced patch points; a stereo program-1, program-2 and monaural output module; a dual remote line selector module and a time-control module.

619-438-3911; fax 619-438-9277; info@pre.com
Circle (183) on Free Info Card

Continued from page 16

Updating the air chain

Audio processing "improvements" (a subjective term) can also produce a noticeable change in audio quality and possibly in usable service area — although the effect of processing on the latter is far less in FM than in AM. Yet, this is perhaps the most effective way to create an audible change in the FM signal (for better or worse).

Other more subtle improvements in the FM transmission path are also possible through the implementation of an all-digital air chain. (See Figure 1.) Digital STLs, audio processors, stereo generators and FM exciters are all available today, with more products expected soon that will simplify and further improve the interface. Both qualitative (stability, fidelity) and quantitative (STL capacity) enhancements can be achieved with these devices. (See "RF Engineering," May/June and July/August 1996.)

Finally, consider what additional subcarriers can do to an FM station's audio signal. The attraction of increased revenue from subcarrier leasing carries a potential penalty to the audio quality of a station's main service. Subcarriers can produce "birdies" on some receivers, as well as exaggerate the audible impact of multipath events. (Generally, the more energy that's on an FM station's baseband, the worse a multipath hit will sound.) With care, these artifacts can be minimized, however. Therefore, proceed with caution when deciding upon the quantity, type and injection levels of FM subcarrier services.

While digital radio broadcasting remains years away, there are still plenty of ways to help FM perform at its best as an analog delivery medium.

John Battison, BE Radio's consultant on antennas and radiation, owns John H. Battison and Associates, a consulting engineering company in Loudonville, OH.

Author's note: Thanks to Bob Surette of Shively Labs for his help on this article.

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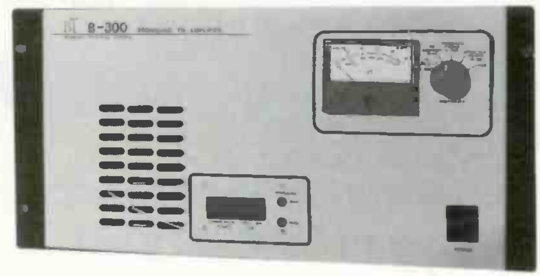

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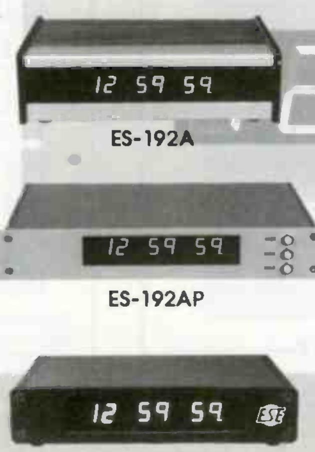

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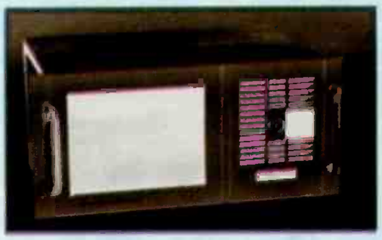
Circle (33) on Free Info Card

CD recordable copier
MediaFORM

▶ **CD2CD copier:** Accomplish one-button cloning of CD titles with this manual CD-recordable copier. The stand-alone system houses the MediaFORM small controller, which identifies and copies complex formats (ISO, CD-Audio, Hybrid, Mixed Mode and HFS) on the fly without the use of an internal hard drive. The CD2CD provides a three-bay enclosure that incorporates separate read and write drives to support 2X and 4X recording. With a unique track extraction feature, tracks from various disks can be mixed and recorded for customized applications.

800-220-1215 or 610-458-9200; fax 610-458-9554; info@mediaform.com; www.mediaform.com
Circle (190) on Free Info Card

Rack-mount display chassis
Industrial Computer Source



◀ **8300 series:** A series of flat-panel display chassis designed to meet operator interface requirements in limited spaces. The 8300 series is 8.75"(high)x14."(deep) and the basic unit comes with a 250W, 120/220VAC power supply, cooling fan, flat-panel controller with interface harness and full power support for the selected display type.

800-677-7329; www.industry.net/indcompsrc
Circle (191) on Free Info Card

MPEG-2 stereo audio codec board
Philips Electronics

• **MPEG-2 codec boards:** The DVD MPEG-2 audio codec is an ISA extension card for personal computers and features technology based on the MUSICORE algorithm. Real-time encoding and decoding are possible for MPEG-1 and MPEG-2, both Layer I and Layer II. The codec supports all standard MPEG bit rates and can encode audio in stereo, joint stereo, dual channel and mono. A SMPTE time-code interface enables synchronized recording and the triggering of start and stop times in scene-by-scene encoding.

408-7373; 408-453-6444
Circle (185) on Free Info Card

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The industry's most comprehensive and accurate pre-show listings and conference information, plus our exclusive Radio Hall map and a tip sheet on the top trends and products to look for at NAB '97.

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Several of the top new radio broadcast facilities in the United States are profiled.

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INTERTEC PUBLISHING

Why RBDS has failed (so far)

By Skip Pizzi, editor

It's been four years since the Radio Broadcast Data System (RBDS) standard was established in the United States, and the format is still hardly a blip on the consumer's radar screen. The rare consumers who want RBDS radios not only find them difficult to obtain, but learn that it's tough to find a sales outlet where anyone even knows what they're talking about.

Minimal penetration, awareness, interest and availability after four years — that's a pretty definite flop by anyone's measure. Whether it will remain so is an open question, but to paraphrase Frank Zappa, if RBDS isn't dead, it sure smells funny. The format's resuscitation will only get harder as time goes on.

Contraindications

RBDS has not failed for lack of champions. The EIA has gone to great lengths in seeding the broadcast marketplace with RBDS encoders, along with conducting a major education and promotion campaign. Meanwhile, the European equivalent of RBDS, called RDS, has received far greater acceptance in Western Europe, where receivers are widely available. Given this context, the failure of RBDS is all the more puzzling and worthy of examination.

On the surface, it's a classic chicken-and-egg problem. While some broadcasters put RBDS on air, few receiver manufacturers followed suit with products or advertising support. Manufacturers continually claim that a full-scale RBDS marketing launch is just around the corner, but many broadcasters are about to give up on the format, feeling that the electronic and automotive industries have dropped the ball.

Although four years may not seem long in the tradition of broadcast formats, those old time frames are fading away as speed becomes more critical. Inertia is death in the digital age.

The real culprit

Yet there is a more insidious reason for RBDS's failure, best captured in that memorable dictum of Deep Throat, "Follow the money." Look at any of today's successful new chicken-and-egg systems — the cellular phone or the Internet, for instance. Consumers are motivated to buy new hardware because they see some value in the content to which the equipment gives them potential access. Then they pay a service fee *on an ongoing basis* to some gatekeeper of that content. It's this continuing cash flow for access to content from a service provider that drives the market created by the system. For the mainstream consumer marketplace, there is no profitable service-provider model in the RBDS environment, and hence no driving force to marshal the manufacturers, broadcasters, third-party content-creators and consumers into a coherent effort.

To prove this point in microcosm, look at the one bright spot on RBDS's scorecard. It involves third-parties who have leased a part of some stations' RBDS auxiliary capacity for special services. While they haven't been roaring successes, either — mostly because they are fairly narrow, "industrial" niche services — at least some positive cash flow to stations has resulted. (Ironically, the same datacasting-for-dollars motivation has actually kept RBDS *off* some stations, where existing and lucrative subcarrier contracts preclude its use.)

Of course, such third-party datacasting existed before RBDS, and has continued since. What was new and appealing to broadcasters about RBDS was its provision of *program-associated data*, allowing FM stations to add multimedia (i.e., text and other data keyed to the station's audio signal) for main-carrier listeners. Unfortunately, there's no long-term cash flow in that (or even the promise of it) — either to broadcasters, content-creators or consumer equipment manufacturers. If nobody makes money on the service, nothing moves.

The next big thing

Like any emerging system, RBDS's stall risks that it will be eclipsed by a better system while waiting for its market to develop. That's just what some proponents of new, higher-speed datacasting systems have in mind. (See "RF Engineering," November/December 1996.) Of course, as "successors" to RBDS, they may be nothing more than turbo-charged Edsels. Higher speeds alone won't be enough to make them catch on. There's got to be some viable, long-term commerce flowing through any new communications system for it to survive.

It's to broadcasters' benefit if any of these systems succeed, however. Putting a display screen on the radio is a lot like putting speakers on the computer screen — perhaps better, from the existing radio listener's perspective. Assuming it displays something the listener wants to see, this could help FM broadcasting remain viable in the face of much emerging and future competition. The key is structuring the system around a service-modeled business, not a toy-modeled purchase, however. Mobilizing the forces required for such a system's success won't be easy, but it could be worth it.


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