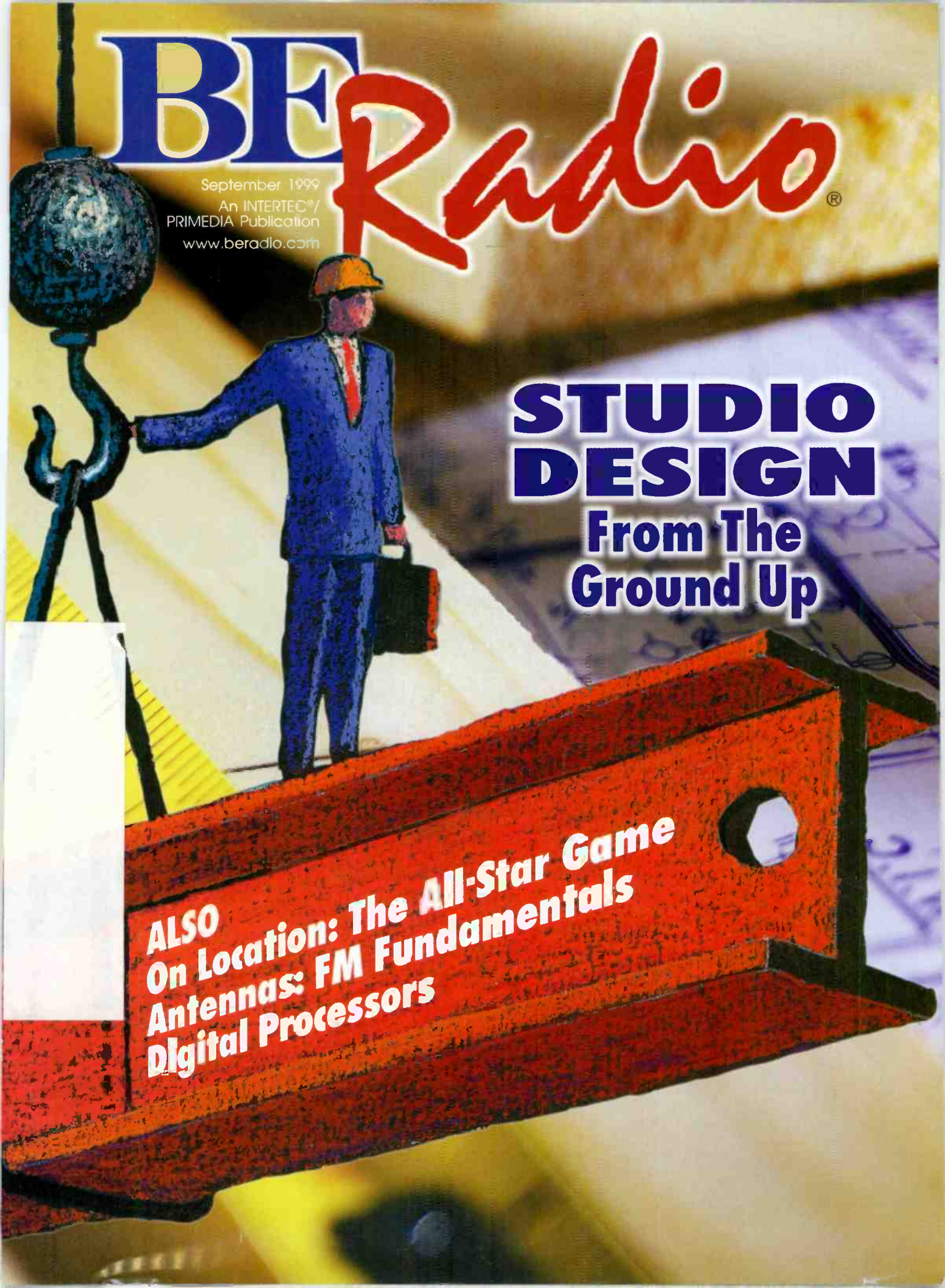
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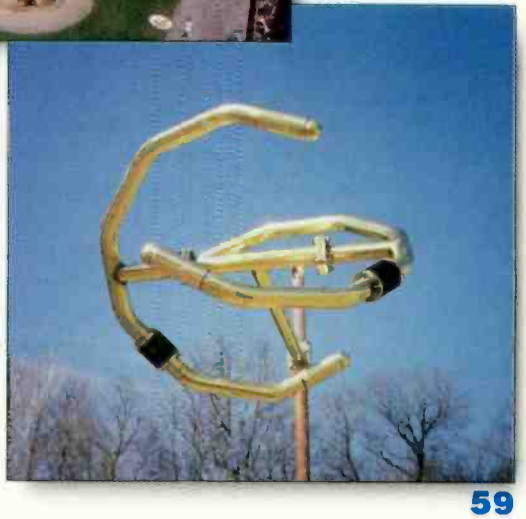

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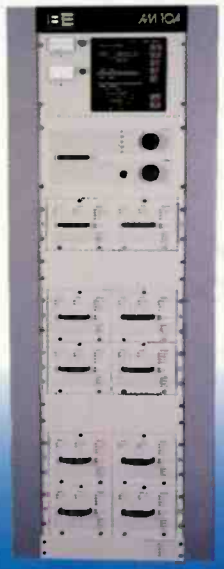

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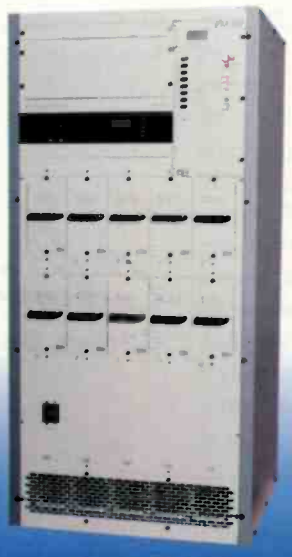

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Buyer beware

Before making a major purchase — a car, a household appliance, etc. — you undoubtedly do some research. You first decide the features that you need and the price you are willing to pay. More than likely, you will also consider the lifespan of the product. For cars and refrigerators, determining the last item is not very difficult. Once the usual factors like wear and tear and daily use are considered, there is not much else to worry about. Cold will always be cold. Roads will continue to take you where you want to go.

For radio stations, capital items are also subject to similar considerations. In some questions, the question of lifespan is not as easy to answer. One such case is buying a new transmitter.

This is not say that we are preparing for the end of the AM and FM bands altogether. Despite other Y2K concerns, radio propagation will not cease on January 1, 2000. On the contrary, there is a great deal of work being done right now to give new life to the radio broadcast bands. Three separate IBOC DAB proponents are working to bring the broadcast bands into the digital environment. I receive announcements almost daily from two of the proponents regarding agreements and alliances that are being struck in pursuit of their goal.

The development of DAB is not really news to you if you have been reading *BE Radio*. We cover DAB on a regular basis. IBOC has also been a prominent topic at national and regional shows for a few years now.

Back to buying a transmitter.

A question that I commonly hear regards the suitability of a transmitter for IBOC use. Will your 25-year-old, tube-based transmitter pass an IBOC signal? Probably not. Will your new solid-state transmitter pass an IBOC signal? Perhaps. The golden question is what transmitter you should buy to be ready for IBOC.

This question is certainly valid. Getting the most use out of a purchase is a good practice, regardless of the industry. The problem is that no one can answer the last question with any certainty. While the three IBOC systems being developed are similar on the surface, the internal structure of each is proprietary. Tests are underway with several transmitter manufacturers to see what will be required to reliably pass a signal.

The transmitter manufacturers involved in these tests are established and well-known. To my knowledge, the transmitters being tested are not all strictly off-the-shelf devices. Even if they are, we do not yet have a standard, so any work done today may be irrelevant tomorrow.

The basic consideration for any digital-capable transmitter is its linearity. This is why older tube models probably will not work very well. Even if one can be modified to improve its linearity, the cost will likely be prohibitive.

The short answer to the golden question is to buy a transmitter to suit today's needs. Be cautious of any statements certifying a transmitter's suitability for IBOC. It is understandable that you would want to purchase a transmitter that will be able to last for the next 20 years in an analog or IBOC application. Just move cautiously. Some of the suitability claims are stronger than others. Keep in mind that only the FCC can certify a transmitter for broadcast use. Since there is not yet an established IBOC standard, no one really knows what will or will not be suitable for use.

Chriss Scherer

Chriss Scherer, editor

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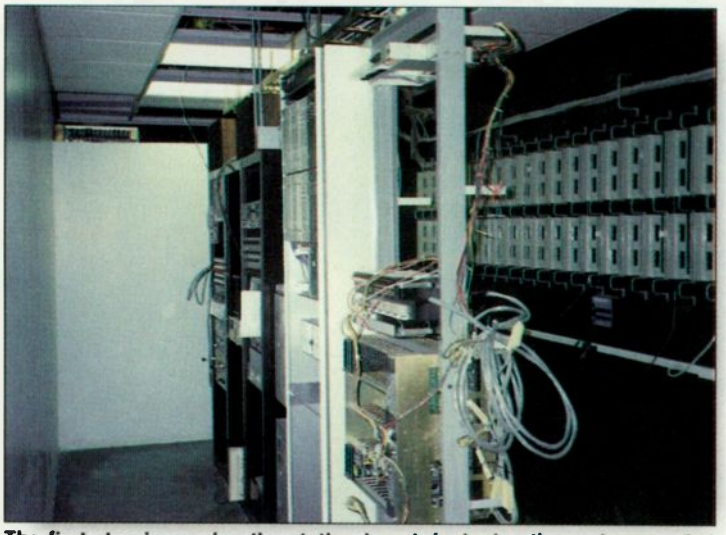
Moving the radio station

By John W. Caracciolo

Planning a radio station move is a huge undertaking. This task separates the men from the boys, the leaders from the followers and the sane from the insane. This is the one project in your career that will make or break you. Be prepared for this task both mentally and physically. Clear your slate and take all other projects off the drawing board.

A facility move will occupy your life (and will likely annoy your spouse) for several months. Today's broadcast engineer must have a solid game plan before undertaking this major project. A facility move should be broken down into three phases: planning and scope, construction, and move in and cut over.



The first step in moving the station is not designing the rack room, but interviewing the station staff.

Planning and scope

The initial step in this phase entails determining the needs of the staff and facility, determining a budget, and roughly mapping out and planning the new complex. There are several phases in the planning stage. One rule that should always be followed is measuring twice and cutting once, or taking the time to do it right. As the project progresses, even minor changes are expensive. Therefore, keeping changes to a minimum is critical to maintaining a budget. The first part of the planning stage is determining the rough layout and translating it into total cost so you can determine your budget.

After a suitable facility location has been chosen, try to set up a construction field office and begin your search for a qualified broadcast architect and project planner. This service is invaluable and must not be overlooked. Not only will the architect help you plan for what you need, but also he will help you maintain your projected budget and goals.

Be sure to conduct an initial walk-through of the new location. Check the general condition and note any required corrections. Pay attention to electrical service, the roof, fire protection and security. Address these items right away so you can begin the planning phase with a clean slate.

Once a firm is chosen, you can get to work — but not by pulling cables and building walls. The next step is to talk with every staff member and manager to assess their needs and wishes for the new facility.

I had the chance to apply this approach in 1994, when relocating two of our stations to a new complex. We were quickly growing out of our existing facilities and planned to purchase the building we would move into. We selected a 38,000 square-foot, three-story building constructed in 1993, which was never completed and was in foreclosure. The building had only one tenant on the first floor. The plan was for the corporate offices, the radio stations and our new syndication company to occupy the entire third floor.

A major part of the planning phase began in our second meeting. The architecture firm visited the old facility and began a preliminary spatial program that initialized the planning portion of the project. They did a complete analysis of the existing facilities with all of its assets and deficiencies. They also spoke with the staff and took notes on their preferences.

At the third meeting, the notes and facts from the existing facility were merged with the needs and wish lists of the staff and management to produce the first of many preliminary blueprints for the job. After many more meetings and telephone sessions over the next few

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weeks, we finally developed a final set of architectural drawings and plans. These plans contained enough detail to properly gather construction bids from contractors.

Considering the staff's needs and wants during the planning stage resulted in the studios and sales areas being laid out in an open, free-flowing design that has a skewed wall theme reinforced by the flooring patterns and carpet borders. The studios and technical areas lie in a strategic area that is accessible by the business and creative sides of the staff. In addition, a major factor in the development of our new facility was keeping an eye toward the future. We planned for several extra studios and a few spare offices and developed a wiring plan with extra multipair cables run to each studio block.

Construction

A complete set of developed plans and prints is your main tool when requesting bids from contractors and tradesmen. Keep specific rules in mind when requesting and reviewing construction bids. The following are common guidelines you will want to follow when you select your contractor:

Contractors can perform specific duties more efficiently and can also help with local ordinance compliance.

- Do not make a selection based entirely on cost.
- Be careful when trying to negotiate a profit for the contractor based on a timeframe or a budget surplus. You do not want a sloppy or carefree attitude.
- Have a set of checks and balances that you go over every week with the contractor so the plan stays on track and the blueprint is followed exactly.
- When reviewing contractor bids, eliminate the lowest bid. If all the bids seem high, you made a mistake somewhere in the planning stage.

Whatever contractor you select, make sure the company is familiar with the local building codes and regulations. Before beginning construction, you must carefully check the codes that may be applicable to your proposed facility, such as ADA compliance, fire-code regulations, and any town or city zoning requirements. For example, you'll need to know if your construction work will require a building permit or certificate of occupancy from the local town hall. This is where the services of a good contractor prove invaluable.

Working with a contractor would have benefited us recently, during a minor studio relocation involving a new STL installation. We were replacing a 30-foot section of tower with a heavier section. Midway through the job, the town issued a cease-and-desist order, requiring us to apply for a building permit to complete the change. This overlooked detail caused a three-week delay and more than $5,000 in unexpected expenses. Know the codes, or have someone working for you who does.

HVAC planning and projection is a critical area that requires professional consultation. Do not be tempted to cut costs in this area. Studios and technical operation areas run 24 hours a day, seven days a week. These rooms require cooling year-round. Bring in a pro.

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Contract Engineering

Move in and cut over

When the day arrives to transfer the operation of the station to the new facility, have plenty of help onboard. Once the technical side of the move is done, the real fun involves moving the staff. This process will test your patience. Nobody likes change; change disrupts an even flow. If possible, hire a professional moving company to move the offices and all the employees' personal belongings. In our case, we required our staff to be on site early on moving day. They were instructed to be ready to direct the moving company and set up the offices. The department heads were divided up into teams, each taking charge of their department and a general area of the facility. For this portion of the move, there are several points to remember:

- Contact the phone company to forward calls.
- Contact the post office to forward mail.
- Leave traveling instructions to your new facility at your old facility.
- File FCC Form 313 if an STL move is required.
- Notify the FCC of your new main studio location immediately.

Once the project is complete, take a breath and a vacation. This is a highly stressful project that requires a positive attitude and patience. As the person in charge of this move, you are the manager of a team. Each member of that team has a different responsibility, but each strives for the same result: the timely, cost-efficient construction of your new facility. Be strong and be a good, solid communicator. Keep to your plan, keep a cool head and you will have a beautiful, functional facility to be proud of in the years to come.

John W. Caracciolo is vice president and general manager for Jarad Broadcasting, Garden City, NY.

Next month in Contract Engineering:
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Keep the LAN/WAN running

By Kevin McNamara, CNE

In a perfect world, your local area network would run flawlessly. Unfortunately, even a well-designed and constructed system is subject to failures, slowdowns and total shutdowns. Problems with LANs in broadcast environments can be compounded by several factors, including the use of low-cost servers, servers located in hot or dusty environments, inadequate power system backup, poorly installed cabling, improper network segmentation, and inadequate network documentation.

Server issues

Most network operating systems run well with a minimal Pentium- or Pentium 2-class PC server. These PCs can be purchased for well under $1,000 and are primarily designed to function as desktop workstations; however, it is unlikely that these systems are designed to maintain a high level of fault tolerance in your network. Network server-class PCs have features such as oversized and, in some cases, dual power supplies, increased cooling, cabinet filters, hot-swappable hard drives and RAID (redundant array of independent disks) drive controllers. They are typically constructed to make board replacement quick and easy. The price of these server-specific systems can exceed $10,000 but, in most cases, the investment will pay for itself several times over in total cost of operation.

LAN test equipment is just as important as audio test equipment. Keep a record of all your readings.

The physical environment of the server is the key to maintaining a reasonable mean time between failures (MTBF). Studies have shown that servers located in a room with extreme temperature changes, high humidity and dust will decrease the MTBF as much as 70 percent. Many larger radio facilities now locate servers in a technical area, where there is typically a favorable, controlled environment that has typically been created to house the station's terminal equipment.

If you are using a workstation-type PC as your server, here are a few maintenance tips you should consider doing routinely, assuming you have the luxury of performing a proper shutdown:

- Remove the cover and use a container of canned air to blow dust and dirt from every crevice of the unit.
- Remove and replace all ribbon cable connectors, making sure that the cables are properly seated.
- Remove and reseat every plug-in board.
- Check for proper operation of the cooling fan, and consider adding additional cooling.
- Notice any unusual noises from hard drives. Drives making a whining or humming sound are ready to fail. Be prepared by making backups of the files on a suspect drive and replacing it ASAP.

Make sure each server is powered by a suitable UPS system. Current UPS systems can be connected to the server with a serial cable. A simple software program (usually provided free of charge) is loaded on the server. When a power failure does occur, the software permits the server to perform a proper shutdown, which greatly reduces the chances for surprises when you restart the system. Also, don't overlook the routine maintenance associated with your UPS system. Every UPS uses batteries that have a relatively short lifecycle, typically 12 months to 18 months.

Larger UPS units have diagnostic routines as part of their internal control and monitoring systems; however, smaller units may have to be tested on the bench.

Cabling

Cabling is a major source of network problems — not necessarily the type of problem that will cause your network to stop functioning, but the kind that causes nagging little headaches you can't seem to figure out. Here are a few of the top problems found with cabling:

- Improper and/or poor quality cabling.
- Improper installation techniques (i.e., kinking or nicking cable. Running cables too close to certain AC sources could also be problematic). If you're using tie-wraps to secure the cabling, go easy on the tension.
- Poor termination techniques (i.e., connectors or punch blocks).
- Cable runs that are too long.

The only way to ascertain that the cabling is not causing a problem is to use a LAN analyzer with a cable-analysis feature. The analyzer will give you a detailed report of the various performance characteristics that are critical to proper operation. Owning such an analyzer is as important as owning an audio test system; you should perform periodic checks and keep records of every cable segment in your plant from installation and every 3 months to 6

months thereafter. Having this information will save you a huge amount of grief (and time) should you run into a problem.

Segmentation

Perhaps the leading problem with poorly performing LANs in broadcast facilities is due to improper LAN segmentation. Segmentation is the process by which you attempt to keep data traffic isolated to specific portions of the network. For example, a properly segmented network in a radio station would allow data used for billing and traffic to primarily be available to the respective departments; data carrying the station's program material is restricted to studio and technical operations — although all of the departments share a common network backbone. Remember that Ethernet networks permit multiple stations to transmit at once but only one is allowed to communicate at a time. Stations that transmit at the same time must wait and try again later.

This collision-based data transport method works well with a few stations connected to the network; however, when a great deal of traffic is introduced (such as that from an audio server), the transport of data slows significantly. In practice, segmentation is handled by the use of routers.

A handheld LAN analyzer or specialized software packages that perform an array of analyses are excellent tools for determining how efficiently traffic is flowing across your LAN or WAN. Routinely measuring all the segments across your LAN or WAN for collisions and errors will give you fair warning to impending performance problems.

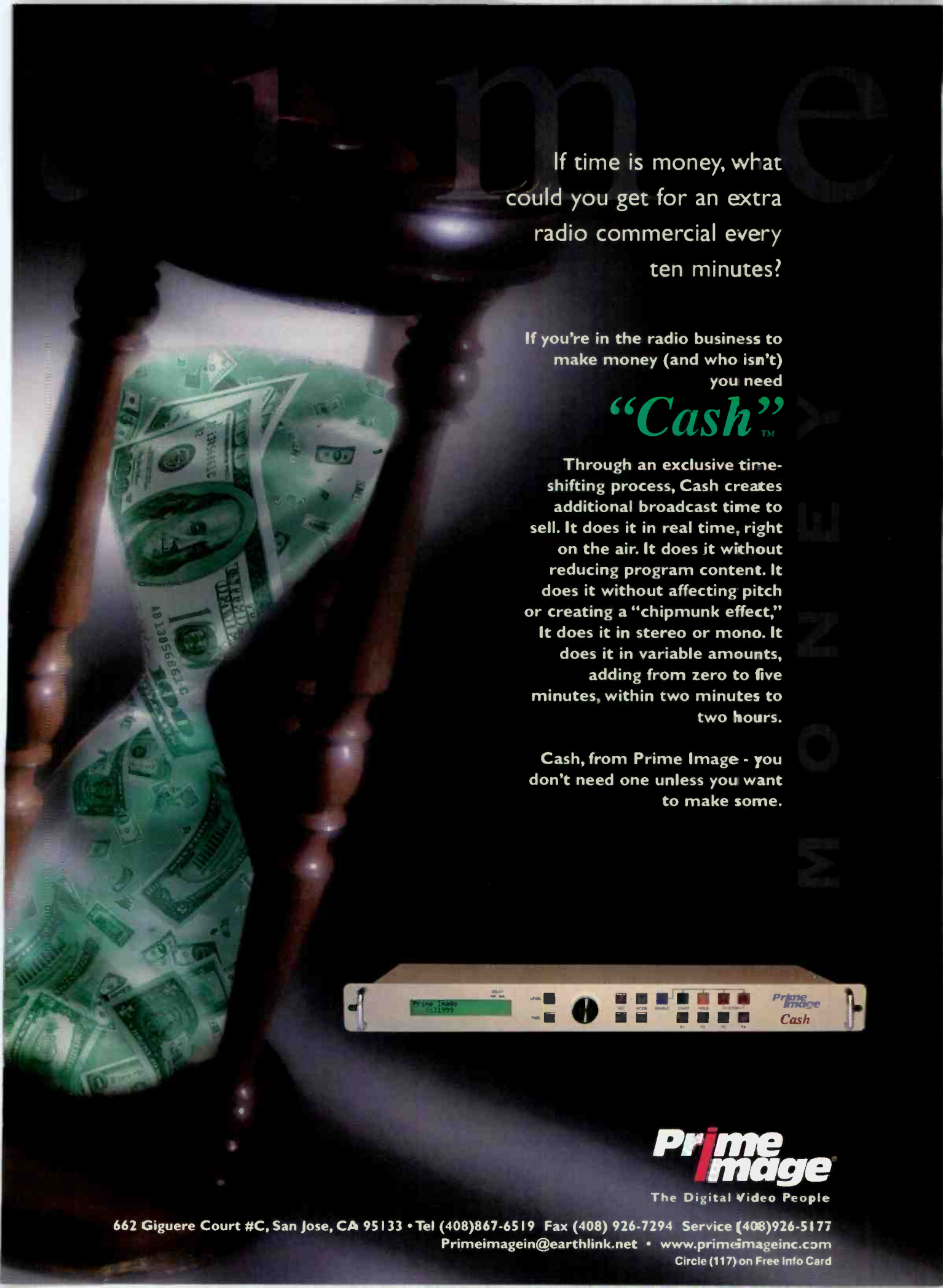
Server location is important in extending the MTBF.

Proper documentation

This is a subject that can never be stressed enough. Always keep current, acccurate documentation on the LAN cabling, servers and workstations. Several software programs will help you gather and store information about your network. They are certainly worthwhile if you have a reasonably large network.

If you implement a good regimen in the proper care and feeding of your network, you may realize you have more time to do the really important stuff, like reloading the operating system on the GM's laptop for the fifth time.

Kevin McNamara is president of Applied Wireless Inc., New Market, MD.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From studio to transmitter

By John Battison, P.E., technical editor, RF

Many early radio stations housed the studios and transmitter in the same building, and getting audio to the modulator required just a single cable. Others had separate transmitters and studios and used a telephone company-provided dedicated line between them. Today, co-located studio/transmitter facilities are not the norm.

There are many possible methods for delivering audio to the transmitter site, and the solutions can be clear or quite complicated. Costs vary from several hundred dollars to several thousand. The old argument of owning versus renting a service continues, but rental agency choices are much greater — and are becoming more expensive all the time. Where a choice of radio or wired connection is available, it must involve the question of immediate capital expenditure on a wireless system, accompanied by continual maintenance and operating expense in components, maintenance, power and depreciation.

Electronic (Wireless) Connections	Physical (Wired) Connections
Part 74 Studio Transmitter Links	Twisted Pair
Spread Spectrum	Equalized Mono or Stereo Line
Part 101 Microwave	T1
Infrared Links	ISDN
Satellites	Fiber Optics
	Carrier Current

Table 1. STL communications can be broken down into two basic types.

On the other hand, a wired system provided by an outside carrier involves monthly rent with the possibility of frequent increases, the potential for indifference to the station's needs and sometimes difficulty getting immediate service. The possibility of damage to equipment still exists; thus, outages beyond the control of the station can occur. We can separate studio/transmitter delivery methods into two major groups, as shown in Table 1.

Tried and true

The familiar studio transmitter link is a well-known and trusted tool. Its successful operation depends on a clear shot between studio and transmitter or, if that is not possible, a bounce shot around an obstruction by means of a static reflector or a second hop. Although there is *apparently* a clear shot between sites, it is advisable to run a profile between them. Also consider future constructions and growth that might interfere with the studio/transmitter shot. It is not uncommon for a station to lose its audio without warning when a new building is erected.

The STL frequency band (950MHz) is becoming cluttered in many larger cities. Volunteer SBE frequency coordinators do a good job of organizing the STL and RPU spectrum. The commission requires any new application to produce proof of frequency coordination. Station engineers can make their jobs much easier by keeping the coordinator informed when applications are deleted or changed. Finding a free STL channel is irritating and time-consuming when the frequency-coordination list contains defunct or never-operated assignments.

Other options

Spread spectrum offers a license-free operation without prior application or FCC notification. The two major systems currently offered appear to provide adequate service up to 20 miles (more in some cases). Because of the nature of spread spectrum and the highly directional antenna systems, interference should not be a problem.

Microwave allocation and use are increasing and, not too long ago, the commission opened Part 101 of the *Rules*, which covers microwave use in the higher frequency bands. If available, microwave operation offers wide bandwidth and the ability to carry as many audio and control signals as desired. The new, small upper-band microwave systems appear to be an attractive option.

Infrared systems suffer from the same line of sight requirement as radio STLs as well as excessive path loss due to weather conditions over distance. For a short connection, this method may be suitable.

Satellites have also taken over the long-distance delivery of audio to the transmitter. In many cases, satellites not only feed programming to the transmitter, but also carry the remote control and monitoring signals. This is especially true in the multistation company where one central source programs and controls a number of stations.

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RF Engineering

As a means of feeding and controlling local studio/transmitter loops, satellites have yet to demonstrate economy and feasibility on a large scale. It does not seem likely that satellites will loom large in most local linking unless and until accessibility and cost of access decrease to an affordable level for small stations.

Getting wired

In the world of wired connections, twisted pairs have mostly gone the way of the crystal detector, except for the rare instances where a run of a few feet is involved. Be sure to use shielded, twisted-pair wire and route it away from any voltage sources.

Analog equalized lines from the telephone company are still an option, but it appears that telcos dislike providing these lines at a reasonable price. A call to your local provider will likely prove this to be the case.

There are many suppliers of ISDN and T1 equipment. The advent of digital technology, coupled with the capability of compressing data, has opened many new doors to unlimited wired audio transmission facilities. Both services require a monthly service charge, and most ISDN services charge for time usage. For a full-time STL, ISDN may not be cost-effective. Also, the reduced data rates require some type of data reduction. T1 services can provide linear digital paths for a flat monthly fee. The added benefit is a wide bandwidth return path for telemetry and many other functions.

Fiber optics offers an attractive transmission system that has no apparent interference weakness. Nevertheless, it does suffer from the same disadvantages as telephone lines. If the entire cable path is over station-owned or controlled land, fiber offers an excellent solution.

Recently, the commission received a proposal to use the electric power lines across country for the transmission of data. Presumably, audio could also be carried using digital methods. Most engineers have experienced problems with carrier current transmission. The usual limits are the pole and other transformers that normally block the onward transmission of radio signals.

Methods exist to couple radio signals past transformers. In fact, around the year 1962, the licensee of a daytime-only radio station in Maryland proposed to operate full time by feeding his signal into the power company lines in Ocean City. This was not a conflict with the commission's rules, and the commission had no say in the matter, provided that the carrier signals did not exceed Part 15 of the *Rules*.

As far as I can recall, the system was not built, possibly because of the cost of bypassing hundreds of transformers. It could work, however, and there appears to be no reason why a similar system could not be used for studio/transmitter feeding. The power lines are already there. This proposal bears watching in the future to see how it develops.

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Portable, nonlinear recording

By Skip Pizzi, executive editor

Over the past several years, the radio industry has noticed that the missing link in computer-based digital audio systems is the field-recording component. Although portable digital audio devices have been available in numerous flavors, DAT, NT (the "Scoopman") and mini-disc (MD), all share a disadvantage with analog field units: Selected audio from field recordings still has to be played into a digital audio editing/production system at real time.

Among those digital media, MD comes the closest to being computer-based. Its small size and low cost are enhanced by the attribute of *nonlinear storage*, which allows quick searching and even some rudimentary cut-and-paste editing in the field. However, the unit's removable media remains proprietary and audio-specific. This means that any transfer of MD recordings to computer-based systems for serious editing, mixing or transport via digital telecommunications (e.g., modem, ISDN, Internet) requires real-time uploading as an initial step, via either analog or S/PDIF interface.

The Nagra ARES-P is a new RAM recorder designed for handheld operation.

PCMCIA devices

In the early 1990s, several portable hard-disk audio recording systems were developed to bridge this gap, but they suffered from high cost and low reliability. Finally, in the last couple of years, practical and cost-effective file-based audio recorders have emerged. They have leveraged the reliability, compactness and economy-of-scale provided by PCMCIA flash-RAM cards. These cards are still expensive in comparison with removable magnetic or magneto-optical media (tape or disc). Yet their ability to download audio files in faster-than-real-time speeds, and their lack of moving parts, allow quick and considerable reuse of media, thus ameliorating its relative cost penalty to some extent. In general, users only need a small number of RAM cards (two to four, typically), archiving items they wish to keep on other media.

Today, a growing range of PCMCIA-based portable audio recorders exists. Just as with other traditional, professional-audio field formats, you can choose from less expensive, no-frills devices to full-featured top-of-the-line models. Unfortunately, not all of these units are interoperable, but this issue seems to be minor when based on user behavior to date (in which the same device is typically used to record and transfer audio).

Standard data compression technologies are implemented, allowing today's commonly available 128MB PCMCIA cards to hold over two track-hours of broadcast-quality audio. Some recorders include two PCMCIA slots, allowing seamless transition between cards for continuous, long-form recording.

RAM recorder features

The capabilities of this class of devices, which have become known collectively as *RAM recorders*, continue to expand. Like traditional linear field-recording decks, users can choose from units exhibiting a range of size, weight, metering, audio I/O and connectors, powering options and battery life.

Other options include automatic record-level control, phantom power for condenser microphones, selectable data compression algorithms and rates, onboard editing, metadata (text titling and other information about the recording), indexing and integrated telecom features. The last item can be particularly valuable for radio reporters, allowing flexible transmission of selected sound clips via file-based or real-time transfer over POTS or ISDN lines.

As these devices grow in popularity, a number of broadcast production and automation system manufacturers have begun to ally themselves more specifically with the trend. It is now possible for some RAM recorders to write or convert files onboard into formats that can be directly imported into several PC-based broadcast systems without subsequent conversion into the broadcast system's native format.

Naturally, this product sector is far from fully mature. Expect more offerings and reduced prices over time, until the format becomes dominant in the industry. The immediate improvement will likely be the reduced size of the recorders. Current units exhibit an over-the-shoulder design, while upcoming models will be handheld. Flash-RAM PCMCIA media will also continue to decrease in price/MB and increase in maximum capacity per card.

The RAM recorder's day has arrived. It's time for serious radio reporters and recordists to consider this product sector for their newest tools.

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Date: Friday, April 30, 1999
Subject: Re: I need 5 reasons I should buy Prophet

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Stuart Engelke
Chief Engineer
WMCA/WWDJ Radio

-----Original Message-----
From: Peter Fiveland comments@nycradio.com
To: WIZARD-L@LISTSERV.BOISESTATE.EDU
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Date: Friday, April 30, 1999
Subject: I need 5 reasons I should buy Prophet

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Casino ad picture still unclear

By Harry Martin

In June, the FCC's rule against radio and TV casino gambling advertising, and the underlying federal statute, were held unconstitutional by the Supreme Court as applied in states where such gambling is legal. In spite of the decision, it is unclear whether the ban has been lifted in states other than Louisiana, where the Supreme Court case originated.

It was anticipated that the FCC would issue a policy statement reflecting its view on how the court's ruling would affect broadcast stations throughout the U.S., but no such policy statement has been released. It appears the commission's policy statement is the subject of a dispute with the Justice Department involving states where there is no authorized in-state casino gambling. The department apparently has taken the position that the court's decision should be limited to the parties in that suit (i.e., Louisiana broadcast stations only). The commission has opposed this viewpoint and has urged the Justice Department to recognize that the court's language applies to broadcast stations in all states where casino gambling is legal. Also, a number of people are trying to get both the Justice Department and the commission to extend the ruling across the country, even to states that do not allow casino gambling.

In a separate but related matter, a U.S. District Court in Mississippi has found in favor of the Mississippi Association of Broadcasters, following the Supreme Court's decision that the ban on gambling advertising is unconstitutional. Until the FCC issues a policy statement, however, making it clear that its casino advertising ban has been repealed, broadcasters in all states, except those subject to a specific court ruling, are at risk if they air such advertising.

$20,000 fine for public file violations

The operator of two California FM stations has been fined $20,000 ($10,000 for each license) for not keeping public inspection files up to date or readily accessible. The FCC held that its rules had been complied with by keeping one of the public files at a local school library where staff could provide access during regular business hours. Another public file, however, was kept at a convenience store where a store clerk was unable to locate it when asked to do so. The clerk's failure to make the public file available to a member of the public upon request was specifically cited in assessing the $20,000 fine. (The amended rule requires the public file to be maintained at the main studio.)

The licensee also conceded to the FCC that neither public file had been updated to include copies of the most recent renewal application, annual ownership reports, annual employment reports, or quarterly lists of programs that discussed community issues. Further, one of the public files did not contain a certification that public notice of the most recent renewal applications had been given. The FCC held that these violations were significant and imposed the $20,000 fine.

New FCC forms

The Mass Media Bureau, in an effort to streamline broadcast application and licensing procedures, has significantly revised key forms, replacing many open-ended questions with yes-no certifications. The new forms are accompanied by lengthy instructions and checklists. The following forms have been revised:

- FCC Form 301 Application for Construction Permit for Commercial Broadcast Station (May 1999 edition);
- FCC Form 314 Application for Consent to Assignment of Broadcast Station Construction Permit or License (March 1999 edition);
- FCC Form 315 Application for Consent to Transfer Control of Entity Holding Broadcast Station Construction Permit or License (March 1999 edition);
- FCC Form 316 Application for Consent to Assign Broadcast Station Construction Permit or License or to Transfer Control of Entity Holding Broadcast station Construction Permit or License (March 1999 edition).

These new editions of FCC Forms 301, 314, 315 and 316 became effective July 15, 1999. The commission will automatically return applications submitted on old versions of these forms.

Harry Martin is an attorney with Fletcher, Heald & Hildreth, PLC., Arlington, VA. E-mail martin@fhh-telcomlaw.com.

Dateline

Radio stations in the following states must file their biennial ownership reports (on new FCC Form 323 for commercial stations) on or before October 1: Alaska, Florida, Hawaii, Iowa, Missouri, Oregon and Washington.

Annual regulatory fees for all commercial stations are due no later than September 22.

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STUDIO DESIGN

By Ron Bartlebaugh

Designing a new facility requires careful consideration and planning. The tips in this article will get you off to the right start.

Someone once said there is a right way and a wrong way for everything. This certainly applies to both the design and construction of an audio facility. Some of the essential areas of concern are acoustics, ergonomics, HVAC, electrical, lighting and grounding. You should also follow a few basic guidelines for the selection of an architect or project consultant.

Begin by answering the most difficult question: Should you attempt to design and oversee this project yourself, or do you need an architect or other professional consultant? For a number of reasons, projects that require new construction or major renovation should always involve an architect. Projects of a smaller scale may simply require hiring a specialized consultant, such as HVAC or other areas of expertise.

Consultants

At least three candidates should be interviewed when selecting an architect or professional consultant. Have each firm make a presentation to your organization so you can determine their abilities and desire to complete your project. Have at least two other people from your company sit in on each presentation, and let the group evaluate the candidates. Ask the following sample questions:

- What projects has the firm been involved with that are similar to yours?
- What backgrounds and experiences do the principal partners within the particular organization have?
- How will the project be approached? Will there be a project manager? How accessible will the persons responsible for your project be?
- What is the proposed project timeline? Define each step from beginning to end. Ask what percentage of their projects end according to the initially proposed timeline and budget.
- What was the percentage of change orders on their last three projects? A high percentage may reflect poor project control.
- What are the firm's proposed costs to you, the client?

Check out the organization's opinion and knowledge of acoustics, grounding, HVAC, and so on. Be sure it is sensitive to and knowledgeable of your special requirements. Ask for references and full contact information. Check out the previous projects each firm has completed, and ascertain the level of satisfaction the references have with the firm's work. Completing this exercise should make it obvious whom to hire for your project.

Whether you are working with a professional architect or consultant or are managing the project yourself, there are several important issues to consider.

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Space

Begin by determining exactly how much space you will need. Plan the use of space in an efficient manner; every square foot is a financial investment in the form of construction or renovation costs as well as heating, cooling and general, ongoing maintenance.

Be sure wide-bandwidth communications circuits are available as needed, including everything from ISDN to wideband fiber. Have at least two good Internet service providers in your area, since every facility now depends heavily on the Net. Verify that cable television is available at your site if the newsroom requires it or if you want to make it available in reception areas.

Range	Wavelength	Frequency (Hz)	Description	Notes
bass	36 ft.	31.5	earthquake	
	18 ft.	63	thud	
	9 ft.	125	boom	male voice fundamental
midrange	4.5 ft.	250	box	small room resonance
	2.25 ft.	500	hoot	female voice fundamental
	14 in.	1000	honk	
	7 in.	2000	nasal	intelligibility
treble	3.5 in.	4000	transistor radio	
	1.75 in.	8000	sssssssss	
	0.88 in.	16,000	tinkle	

Figure 1. Wavelengths and frequencies across the audio spectrum and a relationship to common sounds and sources.

A model of the proposed facility can easily be constructed using a CAD program. Select a program that is compatible with that of your architect or project consultant. By designing each room on CAD, you will quickly visualize the functionality of the facility.

If you are not using a professional architect or other consultant, be sure to locate the industry standards for the sizing of hallways, doorways and other technical specifications. Local building codes often specify minimal sizes for these elements. In addition, the Americans with Disabilities Act mandates minimal access requirements.

Plan the facility correctly before you begin construction. Furniture and equipment should fit easily through halls and doorways. Walls are difficult and expensive to move once they have been erected. Take into consideration isolation of dissimilar environments and flow of traffic between units.

As the design unfolds, look at all facility-wide support systems, including telephone, heating, cooling, electrical and security. Determine that enough telephone lines are available for current and future operations, including all computer and fax modems.

Sound

Acoustics is an area of facility design that is often overlooked or treated as an afterthought. The science of acoustics is far more than a little carpet or a box of the latest glue-on sound panels on the walls. Every studio will have its own set of acoustical criteria that will depend on its physical design. For example, a 125Hz wavelength is 9 feet in length. So, if your room is 9'x9', it may resonate well at 125Hz, thus masking the more important middle and high frequencies in the speech and music range. The normal approach would be to treat the room with an acoustical material to correct the design error. You can reverse this process by designing the room correctly so it does not produce unwanted effects. Figure 1 shows some typical wavelengths at various frequencies.

In a renovation project, the room sizes may not easily be changed. In this situation, acoustical treatments may be necessary, although changing the shape of the room may also be of benefit. If space permits, consider building a room within the room to establish proper room dimensions for the best overall acoustical values.

Though a variety of treatments are available, you should be careful about choice and application. For example, the popular cloth-covered fiberglass products vary greatly in acoustical absorption characteristics. In Figure 2, compare the 1-inch thick cloth-covered fiberglass panel to the 2-inch thick panel. If the 1-inch treatment were used to line the walls of a studio, the sound absorption at 4kHz would be 460 percent greater than it would be at 250Hz. Consequently, the room would sound muffled and contain excessive low-frequency energy. Any microphone will reflect these acoustical limitations, and the result will be an unwanted effect within the room when pure audio is the desired result. In this case, the 2-inch thick material would be a better choice, as it more uniformly absorbs sound throughout the spectrum.

Thickness	Absorption Coefficients						
(inches)	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	N.R.C.
¾	0.08	0.26	0.71	0.93	1.01	1.03	0.75
1	0.10	0.33	0.80	1.05	1.17	1.53	0.85
1½	0.29	0.73	1.13	1.15	1.10	1.18	1.05
2	0.38	0.96	1.16	1.15	1.11	1.28	1.10
3	0.49	1.12	1.23	1.07	1.01	1.05	1.10

Figure 2. Fiberglass panels with cloth covering can be an effective means of sound control. Thicker panels have more low-frequency absorption.

Another major mistake many designers on a strict budget make is the use of carpeting on studio walls. Figure 3 shows the sound absorption characteristics of carpet compared with a popular sound-treatment product. As you can see, even thick pile carpet does little to absorb sound in the lower frequency ranges. Thus, the application of carpet on a studio wall will only serve to create a low-frequency resonant room.

When choosing acoustical treatments, first identify the acoustical problems of the room. Many technical publications contain information

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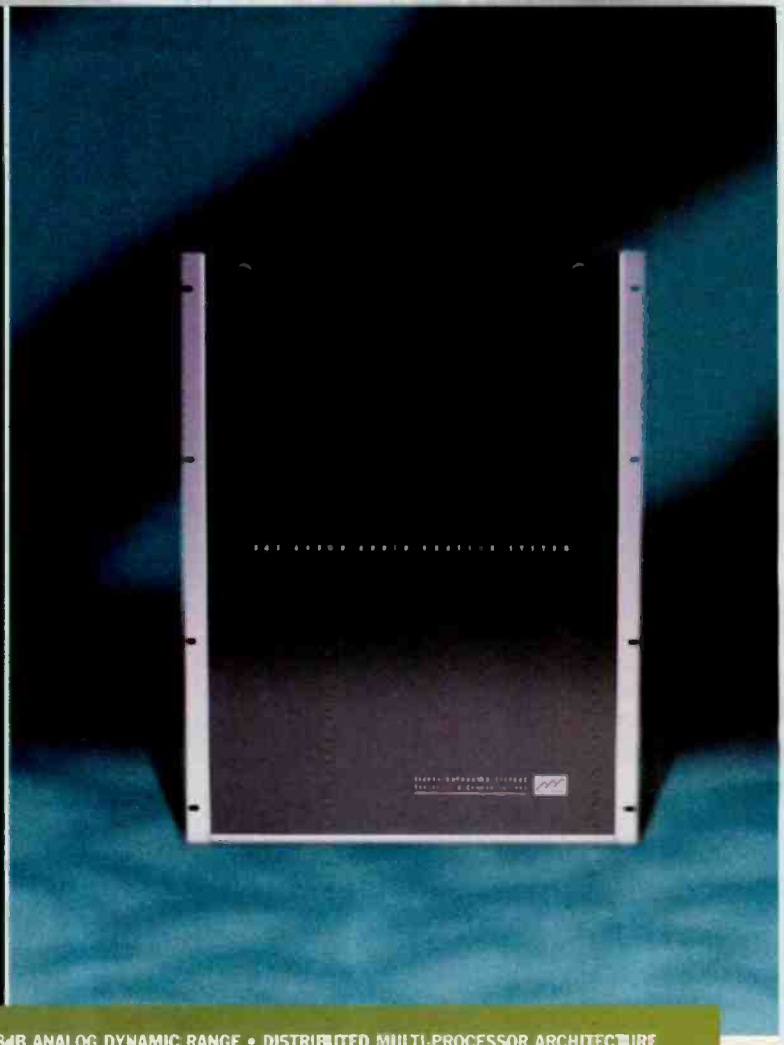

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showing how to calculate reverberant times in a room by frequency. By looking at the data derived from those calculations, the designer can more intelligently select the proper acoustical treatment. Remember, in reality you are tuning a room when changing its physical characteristics. Figure 4 shows how a room can be tuned using proper acoustical treatment methods. In this particular case, the reverberation time of the room at 250Hz was reduced from 1.3 seconds to 0.76 seconds after treatment. The intelligibility factor and brightness of the room significantly improved with the acoustical treatment. In your plans, include the effects of the floor and ceiling, since they are two parallel surfaces that also absorb or reflect sound. Special acoustical doors, walls and windows are always necessary as well to assure a completely correct acoustical environment. Wall, floor and ceiling construction are critical in eliminating low-frequency transmission between spaces. Wall mass is important, so don't be surprised if you end up with walls that are 12 or more inches thick. In the case of problem areas, a qualified acoustician should be consulted.

Equipment placement in a studio is first dictated by function. The acoustic effect is usually secondary but is still very important. Photo courtesy of Murray Company.

A properly treated acoustical space will have the aural appearance of being relatively quiet. Often, other room noises then become apparent, such as noise from lighting or HVAC systems. Locate fluorescent light ballasts external to the room, such as above the ceiling in a hallway. Dimmer packs for lighting should be remotely located. Also, be sure to check out the many diffuser lens options now available for room lighting.

Many of these options permit the designer to specifically control light direction while minimizing glare and increasing overall visual comfort.

HVAC

An incorrectly designed HVAC system often can be the cause of unwanted noise in a studio. In larger systems, the air handlers should be located some distance from the studio location and should be mounted on isolation pads so they will not transmit low-frequency rumble into the facility. The amount of cooling required for each room will vary with the amount of equipment, lighting and people in the room. To determine the cooling requirements

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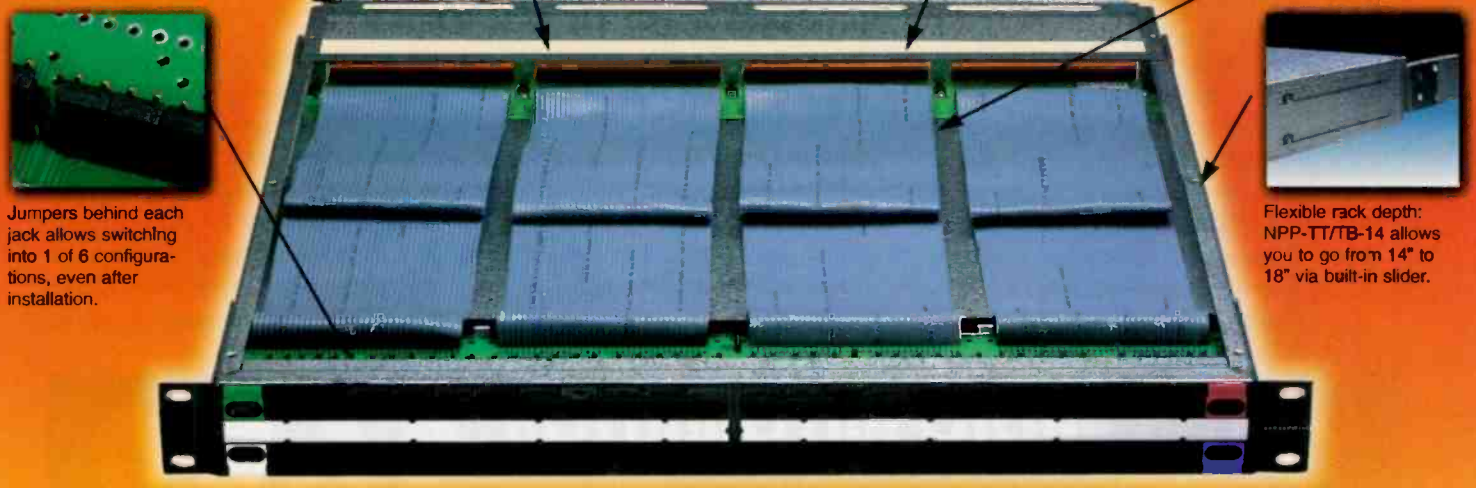

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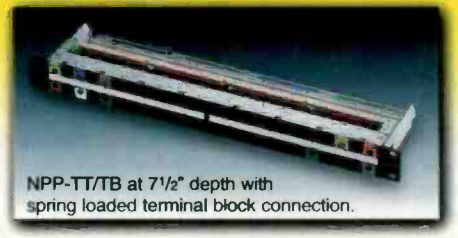

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within the facility, calculate the total heat generated in each room by adding the heat produced from each piece of equipment, the lighting fixtures, maximum number of people in a room at any given time, and any external heat sources, such as sunlight. In many geographical areas, cooling may be required year-round, depending on the heat generated in each room.

In larger HVAC systems, temperatures often can be independently controlled on a room-by-room basis. This will permit the facilities manager to maintain uniform temperature between rooms, regardless of each room's heat generation.

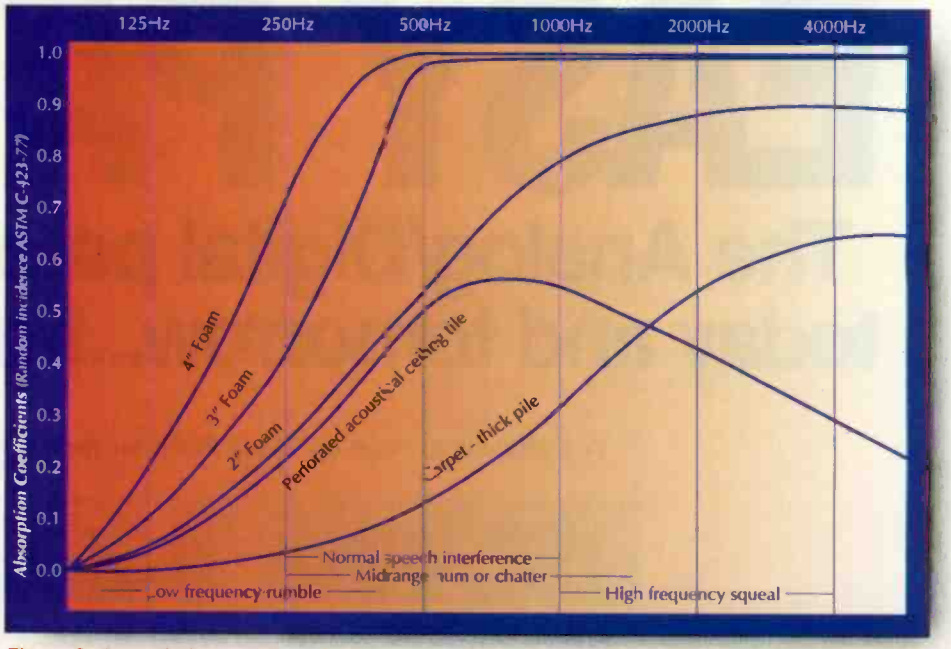

Figure 3. Acoustic foam and carpet are commonly used on studio walls. Carpet does not provide much low-frequency sound absorption, as shown in this comparison.

Air duct and diffuser sizes are as critical in an HVAC system as are airflow rates. Fiberglass flex duct or fiberglass-lined solid duct are best used for supply and return air runs from the air handler to each room. A few appropriate bends in the run will minimize sound transmission. Properly engineer the bend transitions so as not to create air turbulence within the duct. Silencers within the ductwork also may be required to minimize sound transmission from both air handlers and from room to room. Match duct and diffuser sizes to the required airflow rates to minimize or eliminate discharged air sound. In some cases, radiant hot-water heat may be a good alternate heat source when needed.

Power

Electrical and grounding systems are another important consideration in any facility design. The designer must first determine the total power requirements of the facility and then build assurance from the local power company of reliable delivery with reasonable quality. Plan for power outages by having a reliable emergency power

generator available. Be sure to have all facility critical systems powered by the emergency generator, including HVAC, all necessary lighting, systems equipment, security system and refrigerator (include the coffee pot if you can). Whenever possible, a properly rated surge protector should be installed at the main power entry point of the facility. With digital technologies in widespread use, an uninterruptable power supply (UPS) should be mandatory on all critical equipment. A larger master UPS may be a consideration for many facilities where-by power distribution would be provided to the various studios from the larger UPS. Shop around for UPS units; not all provide pure sine wave power. You will find that using UPS units on all critical equipment will minimize or eliminate glitches in transfer of power from the primary power source to the emergency generator and vice versa. Also, plan for future expansion of any electrical power distribution system in order to care for those additional technologies that are sure to arrive sooner than expected.

Design firms and architects need to understand radio operations so that rack rooms and studios are large enough and placed in appropriate locations.

Other considerations

Ground systems should never be overlooked. A good low-impedance ground is a must in every facility. A high-quality star quad system often is recommended in new or existing facilities. Remember that grounding is more than just wires and bus bars. Pay close attention to the mechanical bonding of the building structure as well.

Design engineers often overlook plumbing systems when creating quiet acoustical spaces. Perhaps the following point is obvious, but be sure that no plumbing passes through the acoustical space overhead, underground or in the walls. Plumbing includes water supply lines for building sprinkler systems and outdoor water faucets as well as sewer and roof drainpipes.

Last but not least is the consideration of ergonomics, also known as human engineering. As with any facility, the designer must make several decisions that will affect one's ability to use a facility in a user-friendly and comfortable manner. For radio studio designers, the decision to build a stand-up or sit-down operation is critical. If equipment turrets are to be used, make sure they are positioned properly and loaded in such a manner that even the shortest announcer or producer can reach the top of the turret.

The placement of computer monitors is vital in relation not only to

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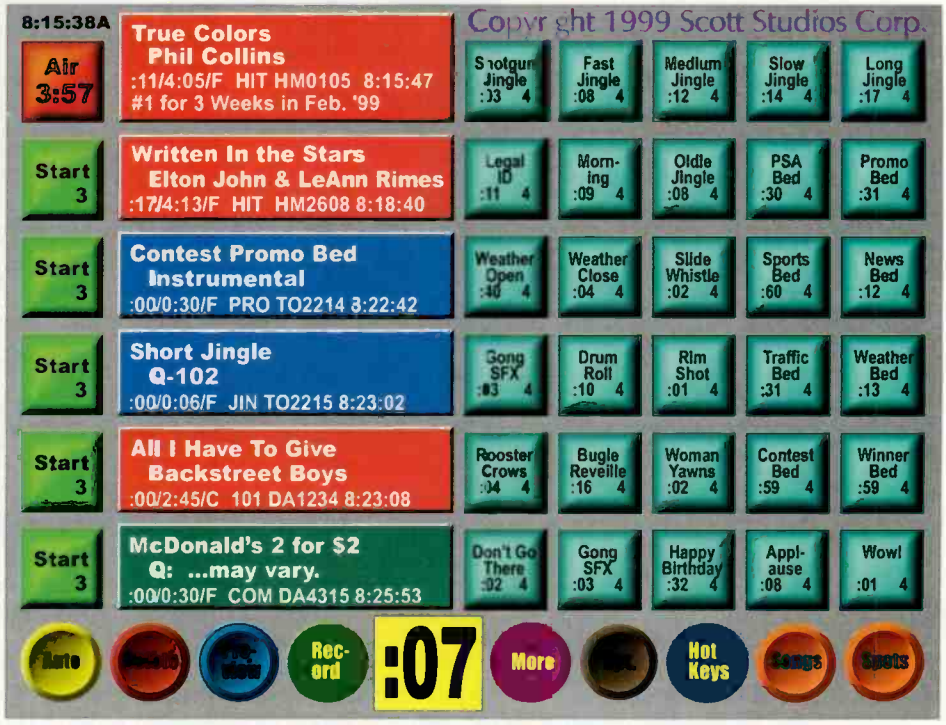
Scott Studios offers *three* different systems in *three* price ranges to suit *any* budget.



This is the user-friendly Scott 32 System, with 30 sets of 30 hot keys, phone editor and all songs and spots on line for instant play! It seamlessly mixes uncompressed and MPEG digital audio!

Good Spot Box

Scott's Spot Box delivers the *simplicity* of a triple-deck "cart" player plus *compact disc quality* digital sound.

Spot Box has only the one screen, so announcers always know what's playing. On the left of the screen, three digital players have clear labels on each spot. VU meter bars show levels. Buttons show countdown times and flash as each recording ends.

At the right of the screen, "Cart Walls" let you pick and play any recording by name, number or category. Or, number keys at the bottom load spots quickly from your log.

Scott's Spot Box includes a recorder and costs as little as $5,000. Options include log imports from traffic computers and music on hard drive.

Better AXS® 2000+

AXS® (pronounced ax'-cess) 2000+ is radio's premier digital audio system for automation and live assist. AXS® 2000+ is fully featured, with 99 sets of 28 instant play Hot Keys, log editing in the studio, live copy on-screen, big countdown timers and can include a production or phone recorder.

You also get auto-fill of network breaks to cover missing spots, a Real Time Scheduler, unattended net recording, timed updates, macros and optional time announce and WAVE file imports.

For stations with large CD music libraries, AXS® 2000+ can also control inexpensive consumer CD multi-pack and 300 CD juke box players.

Best Scott 32 System

The Scott 32 System (pictured at the upper right) is the most powerful digital system in radio. Your log is on the left side of the screen. Everything plays at your touch. On the right, 30 sets of 30 Hot Keys play any spur-of-the-moment jingles, effects or comedy. You also get 10 "Cart Walls" with 1 or 2 second access to *any* recording. A built-in recorder quickly and easily edits phone calls, spots or pre-recorded Voice Trax.

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sight lines but also from an acoustical and lighting viewpoint. Many monitors emit energy that may be induced into microphone capsules. Also, be sure that the computer monitors are placed in such a way that eliminates glare on the screen from the facility lighting.

The placement of equipment turrets also can be critical from an acoustics point of view, as the sides of larger turrets often cause unwanted sound reflection into the microphones. Place these items in their correct ergonomic positions and then consider covering the turret sides with an acoustically absorbent material. There are many software programs on the market that can be used to model a facility and then check for the proper ergonomic positioning of the various systems.

It is important to remember the many areas of concern that each designer faces in any facility construction or renovation project. Thoroughly research any project prior to its implementation. Spend time looking at other facilities, listening to those who have completed successful projects, and reading as much related material as possible. Doing so will result in huge dividends as the project nears completion. Always remember to follow all national, state and local codes, and obtain all necessary permits, including building and zoning.

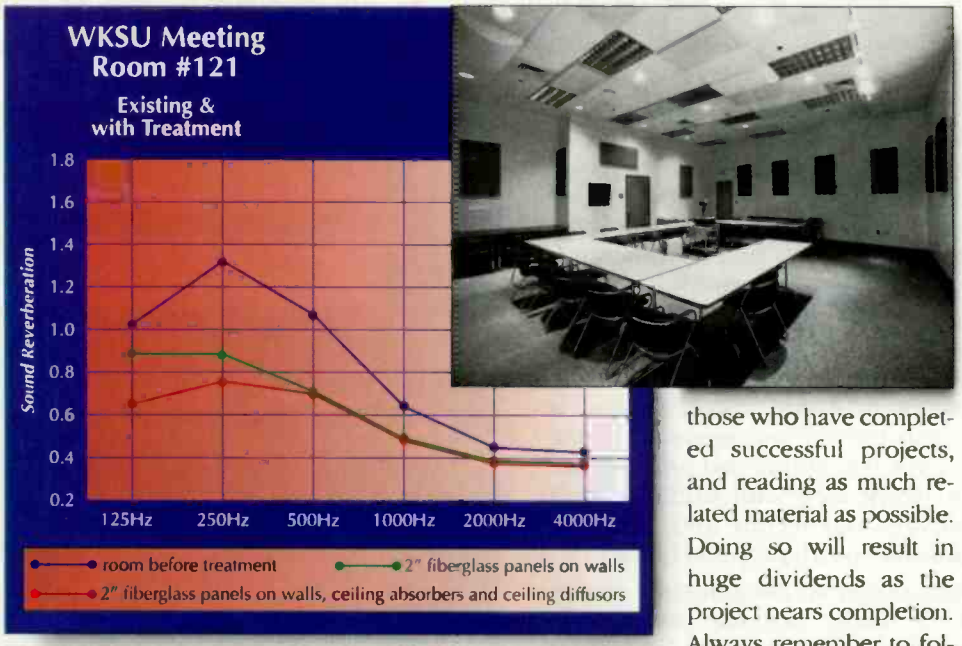

Figure 4. The large conference studio at WKSU had a reverberation problem, particularly at 250Hz. Absorption panels mounted on the walls and ceiling, and ceiling diffusers nearly cut this time in half.

Ron Bartlebaugh is director of engineering for the WKSU Stations, Kent, OH, and president of Audio and Broadcast Specialists, Akron, OH.

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DIGITAL ON-AIR PROCESSORS

By Chriss Scherer, editor

Every station sets its signature with its on-air processing, and your on-air audio processor probably gets more attention than any other piece of equipment. Processing has changed over time, from analog circuitry to DSP.

With analog circuitry, almost every station had its own collection of tweaks and changes to alter a time constant or crossover point for a unique sound. Repeating this process from one unit to the next was not always easy.

Next was the implementation of digitally controlled analog processors. This type of processor added the reliability of digital circuitry to control the analog functions. Settings could be stored, exported and loaded onto another processor with ease.

Digital signal processing adds an additional level of capability. DSP bends some of the rules that analog designers had to follow. Sharper filters, tighter limit control and faster response times are all easy to achieve with DSP.

What's available

There are more product choices for FM than for AM. With Internet broadcasting becoming a viable medium and DAB on the horizon, the tools developed for conventional broadcasting can be adapted to these new applications.

Some manufacturers are taking a family approach to their product line. A single platform is developed to support various applications by loading different software packages. The front panels and hardware may look the same, but they can operate very differently. There are also products packaged and developed specifically for one application.

The applications for Internet and DAB are similar because of the transmission media. Both are pushing bits through a pipe. Both are dealing with some type of data reduced audio as well. Here's a look at what is currently available for all-digital on-air audio processors.

Cutting Edge

Omnia

Of note: The Omnia has a dual PCMCIA slot to accept further enhancements like an additional memory card, a modem or an Ethernet NIC. It can also be assigned an IP address for access over a network or the Web.

Features:

- Uses: FM, AM, DAB, Web
- Inputs: analog, AES3, SCA (2)
- Outputs: analog, AES3, comp. (2), pilot reference
- Communications: RS-232, PCMCIA
- Control inputs: 8
- Control outputs: none
- User interface: wheel, select buttor
- Sampling rates: 32, 44.1 or 48
- Bit resolution: 18
- Options: hot, veris and space-etx modules; .fm, .am, .net, .dab, .fm.jr models

Circuit Research Labs

Millennium

Of note: The final limiter sampling rate is 256kHz. It is also available in a variety of front panel colors.

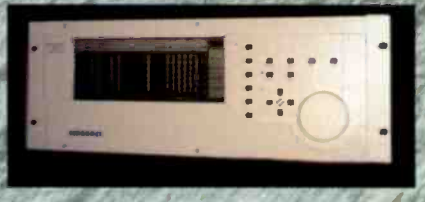
Features:

- Uses: FM (AM coming)
- Inputs: analog, AES3, SCA (4), TOSLINK
- Outputs: analog, AES3, composite (2), TOSLINK
- Communications: RS-232 (2)
- Control inputs: 6
- Control outputs: 8
- User interface: wheel, touchscreen
- Sampling rates: 32-, 44.1-, 48kHz
- Bit resolution: 20

Tiesseci

Digital 9500

Of note: Free software updates are available via Internet download.



Features:

- Uses: FM, AM, Web, DAB
- Inputs: analog, AES3, SCA
- Outputs: analog, AES3, composite (2)
- Communications: RS-232
- User interface: wheel, soft keys, hard keys, cursor
- Sampling rates: 32-, 44.1-, 48kHz automatically selected
- Bit resolution: 24

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ON-AIR PROCESSORS

Orban

2200

Of note: 1RU device with multiple features.

Features:

- Uses: FM
- Inputs: analog, AES3
- Outputs: analog, AES3, composite (2)
- Communications: RS-232
- Control inputs: 8
- Control outputs: none
- User interface: wheel, soft keys, hard keys
- Sampling rates: 32 to 48
- Bit resolution: 18
- Options: Digital option offers AES3 inputs and outputs

6200

Of note: Similar in form to the 9200, there are two versions of the 6200 for use with webcasting or DAB.

Features:

- Uses: DAB, Web
- Inputs: analog, AES3, digital sync
- Outputs: analog monitor, AES3
- Communications: RS-232
- Control inputs: 8
- Control outputs: none
- User interface: wheel, soft keys, hard keys
- Sampling rates: 32, 44.1 or 48
- Bit resolution: 20

8200

Of note: Software version 3.0 is the current version.

Features:

- Uses: FM
- Inputs: analog, AES3, SCA
- Outputs: analog, AES3, composite (2)
- Communications: RS-232
- Control inputs: 8
- Control outputs: none
- User interface: wheel, soft keys, cursor
- Sampling rates: 32 or 32, 44.1 or 48
- Bit resolution: 18

9200

Of note: This is a mono unit. It is also the only fully digital AM-only processor.

Features:

- Uses: AM
- Inputs: mono analog, AES3
- Outputs: mono analog (2), AES3
- Communications: RS-232
- Control Inputs: 8
- Control Outputs: none
- User interface: wheel, soft keys, hard keys
- Sampling rates: 32,44.1 or 48
- Bit resolution: 18

IDT

DVP

Of note: Processing is performed by *Fast Fourier Transform* (FFT). This new method of DSP control for audio processors does not split the audio into different bands, but performs its processing on the entire audio band at once.

Features:

- Uses: FM, AM
- Inputs: analog, AES3
- Outputs: analog, AES3, composite (2)
- Communications: RS-232
- Control Inputs:
- Control Outputs:
- User interface: Windows software
- Sampling rates: 32-, 44.1-, 48-, 96kHz. Internal processing is done at 96kHz.
- Bit resolution: 24
- Options: TCIP/IP connection, software plug-ins

TC Electronic

DBMax

Of note: The DBMax can be configured as a single- or 5-band processor. It includes a PCMCIA slot for up to 2MB additional memory.

Features:

- Inputs: analog, AES3, SPDIF, word clock (BNC)
- Outputs: analog, AES3, SPDIF
- sample rates: 32kHz, 44.1kHz, 48kHz
- resolution: 24 bit
- user interface: hard keys, wheel
- communications: RS-485/RS-422
- control inputs: MIDI, GPI (1/4-inch TRS)
- control outputs: MIDI

More digital: FM Stereo generators

Digital STLs, both wired and wireless, have become popular, but most do not transmit a composite signal. Because of this, stations are installing their on-air processor at the studio and using a stand-alone stereo generator at the transmitter. If you place your processing before the STL, you can still take advantage of digital stereo generation and keep your signal path fully digital as long as possible.

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A SYSTEMATIC APPROACH TO AUDIO PROCESSING

By Martin Acuff, CBRE

Getting the desired sound for your station can be difficult and frustrating. To complicate the matter, there are many types of processors in use, both old and new. Moreover, there is not one audio aesthetic; several factors determine a station's ideal sound. Fortunately, you can follow a systematic approach to tailor your station's sound and achieve the desired results.

Tuning a station's audio processing requires artistic judgment and technical experience. The basic approach is finding your preferred sound incrementally, usually by adjusting past the optimum tuning point, then backing it off. It is unlikely that the first pass of adjustments will meet your objective, so you should employ a progressive approach to the task. The following sections detail this approach to achieving the on-air sound you are looking for.

Subjectivity and definition

If the general manager, program director and engineer have diverse preferences, define who will be the ultimate judge of your station's sound. This is an opportunity for interdepartmental teamwork. Secure the best outcome by uniting all players toward a common objective.

For a broader perspective on your station's sound, consider using audience research. Such research is unbiased and will prove more reliable than depending solely upon intuition or the preferences of one (or a few) individuals at the station.

There is no right or wrong audio quality, only a scale of preferences. The best sound for your station is processing that maximizes your target audience. Align your processing objectives to complement the overall audience, format and business plan. For example, if increased *TSL* (*time spent listening*) is a priority for your station's ratings, aggressive processing for dial dominance is not appropriate.

Formats such as CHR and urban often benefit from a highly processed sound that increases the energy level of the presentation. Compression and equalization can do this without excessive clipping.

Good judgment must be the rule. In comparison with audio processing, it's much easier to tune the RF section of a transmitter because there is a meter

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indicating when tuning is ideal. There is no meter to indicate that processing is in tune; you must rely on your artistic judgment. Defining the ideal point on the scale is perhaps the most difficult tasks in meeting your objective.

Legal limitations restrict peak modulation. Peak modulation and perceived loudness are not the same. A minimally processed classical format can have the same modulation peaks as an aggressively processed hot urban format, although the latter will sound much louder on the dial. Increasing loudness by simply cranking the modulation invites legal penalties; more effective (and less costly) alternatives exist. Loudness is perceived approximately as the average power level of audio. However, many short-duration peaks in unprocessed audio go much higher than the *perceived loudness* level. This difference is commonly referred to as the *peak-to-average ratio*. These short-duration peaks contribute nothing to perceived loudness but do determine the limits of modulation. The purpose of all broadcast audio processors is to reduce the peak-to-average ratio to elevate perceived loudness without exceeding the peak limitations.

System considerations

No audio processor can repair source audio that is noisy, distorted, excessively bit-rate reduced or suffering from other maladies. In fact, aggressive audio processing exaggerates defects in the source material. The best-sounding stations start with the best-sounding source material.

Installing more audio processing components in your system will not

Tuning the audio processing is not as easy as tuning an RF amplifier, since there is no magical meter reading to indicate the proper setting.

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MP-2-4	4	2,000W	3.3	$1,820
MP-3-5	5	3,000W	4.1	$2,270
MP-3-6	6	3,000W	5.2	$2,740

LOW POWER CIRCULAR SERIES

Model	Bays	Power	Gain	Price
GP-1	1	2,000W	-3.1	$350
GP-2	2	4,000W	0	$1,350
GP-3	3	6,000W	1.5	$1,900
GP-4	4	6,000W	3.4	$2,600
GP-5	5	6,000W	4.3	$3,150
GP-6	6	6,000W	5.5	$3,700

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SGP-2	2	8,000W	0	$2,690
SGP-3	3	10,000W	1.4	$3,595
SGP-4	4	10,000W	3.3	$4,500
SGP-5	5	10,000W	4.1	$5,300
SGP-6	6	10,000W	5.2	$6,100

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AUDIO PROCESSING

guarantee better-sounding audio. It does, however, guarantee greater difficulty in managing the audio processing to achieve the desired result. Additional components increase risk of failure and often degrade the audio. Changes made to the first component cause downstream components to react in sometimes-unpredictable ways. In general, it's wise to minimize components in the audio chain.

Peak overshoot is the enemy of perceived loudness. Every percent of overshoot broadcast is about 0.1dB of loudness sacrificed. Therefore, every component in the system following and including the broadcast audio processor must have the lowest possible overshoot.

Not all audio processors are created equal. Probably the best measure of an audio processor's performance is how effectively it can reduce the peak-to-average ratio without introducing unpleasant artifacts.

Components in the system must be arranged to deliver the best peak control possible (i.e., minimal overshoot) to the transmitter. A common problem is locating the main audio processor prior to an overshooting studio to transmitter link (STL); if the audio with overshoots is applied directly to the transmitter, you must reduce modulation (and loudness) to remain legal. Two common solutions are to relocate the main audio processor after the STL or to fix the overshoot problem in the STL itself. While some newer exciters have built-in overshoot limiters, they should be used only as a last resort if you can't eliminate overshoot by other means. Moreover, composite clipping is not appropriate to compensate for overshooting STLs because it adds audible distortion and interferes with SCAs and the stereo pilot tone, reducing your stereo coverage area.

Peak overshoot is the enemy of perceived loudness.

Receivers differ. What sounds great on a $3,000 receiver will not sound the same on a $100 boom box. Act upon the broadcasting system as a whole: from the studios to the audience. Appraise through the lens of the entire system: processing components, STL, transmitter and receiver.

Listen in varied environments, especially those typical for your audience. In addition, if your target audience typically listens at low volume, it's wise to do the same. It's prudent to have a high-quality monitoring system as a reference, but always keep things in context of the target audience.

Where and when to tweak

Pick a starting point. It doesn't matter whether you're walking in cold or correcting an ongoing problem. If you have an analog processor, start with one of the suggested settings listed in the operating manual. If you have a digital processor, try one or more of the manufacturer's recommended presets as a starting point. Some digital processors have the added advantage of a single control that scales many parameters to your preference, making the task of adjustment much easier than tweaking individual paranteters, and less time-consuming.

APPROACH TO AUDIO PROCESSING

Decide what to tweak. Make an effort to understand the operation of your audio processor(s). Study the operating manual(s). Understand the effect of each adjustment — what it will do and won't do for your sound. Adjusting the Automatic Gain Controls probably shouldn't be your first choice to correct a clipping or distortion problem. Furthermore, manufacturers implement traditional controls in different ways: AGC drive may not perform the same on different products. If you are uncertain about the description of the *Throbulator* control, you may wish to carefully sweep that control through its range while monitoring its effect. Be careful if you do so, as some controls can yield significant changes, and make sure to return it to its original position. If you're still uncertain, call the manufacturer's technical support.

Document everything you do and *document each change along the way.* At some point, you'll need to back up to a previous setting. For analog processors, create a chart tabulating all relevant parameters, and the date of each change (see Figure 1). If you have a digital audio processor, save each change to a preset. That way you can revert to any previous settings whenever needed.


WXYZ Processing Log

1/8	8	0	5	6.5	7	4	2	+1	3	2.5	4		
2/10	12	0	5	4	6	4	4		3	3	4		
2/17	10	0	5	5	6	4	3	+1	3	2.5	4		
2/24	10	0	5	5	4	4	3	+1	3	2.0	4		
3/2	10	0	5	4	4	4	3	+1	3	2	4		
3/14	10	0	5	7	7	2	3	0	2	2	2	FORMAT CHANGE TO NEWS	
3/24	12	0	5	7	7	2	5	0	2	2	2		
3/29	12	0	5	5	7	2	5	0	2	2	2		
4/1	12	0	5	7	7	2	5	0	2	2	2		

Figure 1. Make a log of all the processing changes being made. This will facilitate returning to a previous sound.

Proceed one step at a time. Use an incremental approach to adjusting the audio processing. As mentioned earlier, taking a single huge leap is seldom (if ever) effective. Make small changes to perhaps only one or two parameters per adjustment session. Then listen. Making large changes to many parameters in one session is difficult to manage. The downside to making small adjustments is that differences can be too subtle to notice.

Allow plenty of time to judge the effects of your changes. Sometimes the consequences will not be immediately evident. What sounds great on your $10,000 monitoring system may sound wimpy on a car radio. So, listen to many selections, from many sources and program types. Listening over time will also give your ears an opportunity to rest and time for you to formulate an opinion.

Determine a stopping point. If the present on-air sound is far from your goal, it's relatively easy to judge changes to the audio processing. However, as the processed sound approaches the goal, subjective differences from the ideal become smaller and increasingly subtle. Take your time.

Martin Acuff is product manager for audio processing at Orban. macuff@orban.com.

Windows to the Web

www.contelec.com

Continental Electronics: Things to find on the www.contelec.com Web site are: District Sales Manager's contact data; Factory Marketing & Sales personnel contact data; E-Slide - FREE engineering software; Product Line Descriptions and Specifications; Links from Broadcast Supply Division to vendor Web sites.

www.neutrikusa.com

NEUTRIK USA, Inc.: The NEUTRIK USA, Inc. website features direct links to various sites including Authorized Distributors, Sales Representatives, NEUTRIK USA, Inc. offices and our parent company's website for on-line access to spec drawings through WHIP files. Viewing includes a What's New section for new product introductions and a Trade Show section so that you can come see our products in person!

www.beradio.com/studio.cfm

The Studio Spotlight: *BE Radio* brings you into some of the newest radio on air and production facilities in the country. This website feature shows you the studios and tells you what was done to make it the showcase facility that it is. All the previous installments are available in the Spotlight Index. Show the world what your facility looks like. If you would like your studio featured in the Studio Spotlight, send a message to *beradio@intertec.com* and tell us about your facility.

www.dataworld.com

Dataworld: Dataword is an industry-leading information services company founded in 1971. Twenty-eight years of software development and data processing experience allows Dataworld to set trends in information services and solutions. Click on Dataworld's home page for exciting information on our Flag Service, the production of DataXpert and our new line of digital television services.

www.beradio.com

***BE Radio* magazine:** *BE Radio* gives radio station managers and engineers the information they need to make critical equipment purchase decisions. The magazine is published 10 times a year and distributed to over 14,000 qualified subscribers in North America. Look online for the Studio Spotlight - an exclusive Website feature showcasing some of the newest radio facilities in North America.

www.omt.net

OMT Technologies: MediaTouch by OMT Technologies provides radio stations with state of the art digital audio systems for live assist or full automation use. With over 14 years of broadcast experience, MediaTouch has innovative software solutions starting as low as $995. Surf to MediaTouch, see our exciting new products, and find out how our clients sound better and save money with our unsurpassed quality, reliability, and support.

BASEBALL'S ALL-STAR GAME

The boys of summer take on the green monster.

By Chriss Scherer, editor

The Major League Baseball All-Star Game marks the middle of the baseball season. This midsummer event brings baseball's greatest talents together to celebrate America's favorite pastime. Broadcasting an event of this scale on the radio is no small feat. ESPN Radio broadcast the game and some of the other festivities surrounding it over its network of stations.

Planning for the broadcast began in January, long before the first pitch was thrown. Like any live broadcast, there is only one chance to get everything right. The teams on the field are composed of players who are not usually teammates, but those in the radio booth are a well-versed crew.

The first step in the broadcast involved a physical site survey. The

Photo courtesy of Boston Red Sox

Photo courtesy of Boston Red Sox

Al Rosenberg (L) and Bryan Learned (R) set up for the broadcast.

facilities were inspected for electrical and telephone (POTS and ISDN) access, and locations were chosen for field interviews. After the initial site visit, discussions about the technical goals and plans of the broadcast began. One of these goals was to keep the broadcasts fresh and interesting rather than falling into a series of repeat performances. To make this year's event distinctive, audio originated from four locations: via the announce booth, an interview area just off the field, and two roaming reporters in the stands. The game broadcast was also tied in with one of the shows on ESPN Radio, *Game Night*, which originated from Boston the day before and the day of the actual game.

In April, the plans were reviewed and a technical staff chosen. The technical staff decided what equipment would be used for the event.

One month before the game, installation of the POTS and ISDN lines was confirmed, and a review of all the people required and equipment involved was performed. The operations manager, Bob Sagendorf, arrived four days before the game to make sure everything was ready. The early arrival time allowed Sagendorf to correct any problems.

Going on-air

There were actually three events associated with the All-Star Game: The All-Star Gala, the Home Run Derby and the game itself. The Gala was held in a lot across the street from Fenway Park the day before the game. The Home Run Derby was held the night before the game.

During the Gala broadcast, the show hosts were set up at the Gala itself, while the guest host was positioned inside the park. The two locations were only 100 feet apart but, rather than tying the two positions together locally, the decision was made to have both positions send and receive their audio through the ESPN broadcast center in Bristol, CT. This method worked well and provided some redundancy in case of a problem with one of the ISDN feeds.

The main backhaul was carried over ISDN on a Telos Zephyr running Layer III. The return feed was sent using G.722 coding for the shortest delay time. As a backup, a POTS feed was established with a Comrex Hotline.

The booth has three levels. The announcers sit on the lower level in the front for a clear view of all the action.

ALL-STAR GAME

The producer and engineer sit on the middle level of the booth. Most of the equipment is also located here, including the wireless transmitters and receivers, codecs and console.

Batter up

The equipment setup for the game itself was the most complex part of the broadcast. The engineer's position in the announce booth served as a local master control point, with all the audio sources coming into and going out of this location. Figure 1 shows the signal path for program and monitoring. Most of the signal routing was accomplished within the announce booth, which simplified the setup.

In addition to the announcers' mics, an audio feed was taken from the TV coverage to provide ambience. This effect feed helped fill in the aural images; listeners could hear the sound of the ball hitting the catcher's mitt, the runner sliding and the bat cracking. The TV audio

The engineer's rack has some IFB capability.

The Producer communicates with everyone with a custom IFB interface. This unit also controls the producers headphone mix and levels.

control room was only a few booths away. About 100 feet of audio cable had to be run to get the signal to the radio booth.

During the Home Run Derby, an additional audio feed came from lavalier mics placed on the batters, adding another element to the listening experience.

The producer communicates with everyone through a custom IFB interface. You can see a creme-colored box in the booth photos. This project box is really a housing and connector panel for several compact mixers, distribution amps and switchers. The

Equipment list

Main booth

Spirit by Soundcraft 12x2 console, Telos One hybrid, ATI mixer, Symetrix 425, Gentner Telecoupler, Sennheiser HMD25 headset mics, Symetrix SX-204 headphone amp, Shure FB22 headphone amp, custom designed IFB interface built with Radio Design Labs Stick-on boxes

Sidelines

Vega 2020 and Lectrosonics 200 wireless mics, Lectrosonics T1 wireless IFB transmitters, R1 receivers

Interview room

Electro-voice 635 mic, Shure FP11 mic pre-amp, Shure FP22 headphone amp

producer is able to communicate directly and independently with anyone wearing a headset, including the engineer, booth talent, field talent, field producers and master control in Connecticut. There is also a single switch to communicate with everyone at once. The interface handles all of the switching and level control for the IFB send and the headphone mix for the producer.

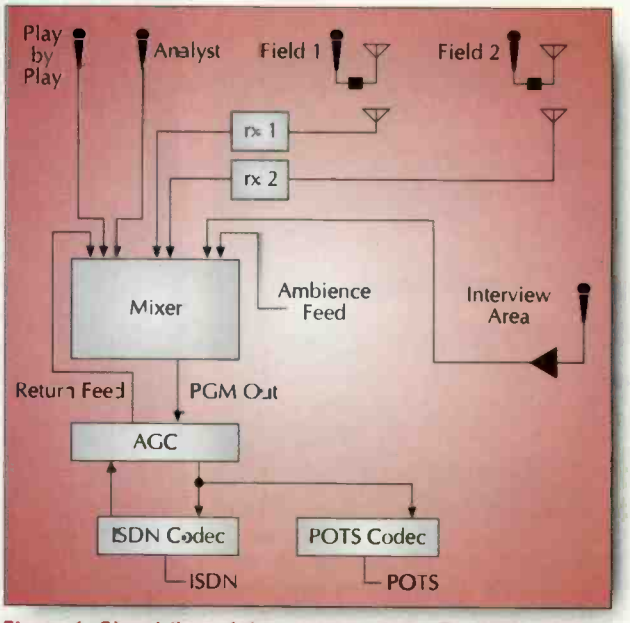


Figure 1. Signal flow of the program chain. The IFB routing is much more complex.

Remote setups are designed to be compact and portable. ESPN Radio has made no exception to this rule. All the remote equipment fits into four cases. Coverage of the All-Star Game requires the same equipment complement as any baseball or basketball remote, with the exception of a few additional pieces for the Gala and the live show. After six months of planning for this three-hour event, the equipment is packed up and the network begins preparing for the next game, just like the players themselves.

An additional compact mixer was used for the *Game Night* portions of the broadcast. It is shown here set up in the lot across the street from Fenway Park.

Thanks to Bob Sagendorf, operations manager, John Martin, executive producer, NBA, MLB, Bowl Championship Series, and Al Rosenberg, remote engineer at ESPN for their help in preparing this article. Except as indicated, photos by Brian Snyder, Cambridge, MA.

FM ANTENNAS Fundamentals

By John Battison, P.E.,
technical editor, RF

The antenna series moves to the FM band to cover transmission and propagation characteristics as well as some of the differences between AM and FM.

This is the seventh in a series of nine articles on basic broadcast antennas.

So far, this series has discussed AM operation. This installment presents matters concerning FM transmission and propagation characteristics as well as AM/FM differences. Methods of FM signal generation will not be discussed; the topic is thoroughly covered in the general transmitter literature. We are concerned instead with handling the signal on its way to the listener and with finding the best way to get it there.

FM characteristics

The FM broadcast band extends from 88.1MHz to 107.9MHz and is divided into 100 channels, each of which is 200kHz wide. The minimum spacing between channels in a given market is 800kHz, or four channels. The actual operating bandwidth was originally ±75kHz for 100-percent modulation, with a guard band of 25kHz on each side. A number of years ago, when the use of Subsidiary Carrier Authorizations (SCA) became popular, the FCC raised the permissible swing to ±82.5kHz, or 110-percent modulation.

In AM operation, we are accustomed to equipment that operates with wavelengths measured in hundreds of meters. A middle of the dial AM frequency of 1000kHz translates to a wavelength of 300 meters, or about 990 feet. An FM middle of the band wavelength would be about 3 meters, or 10 feet.

A half-wave antenna (tower) in AM would be about 485 feet. In FM, it would be about 5 feet to 6 feet — about the height of the average person. That's one reason why the non-ionizing radiation rules are tougher in FM, because a human a half wavelength tall may tend to resonate strongly in an FM field.

In AM, the emphasis is more on high-ground conductivity than height above ground, provided the required minimum efficiency is obtained. This is true for a single tower about one-quarter wavelength tall or an antenna system comprised of a collection of towers. The modern FM antenna with radiating elements of perhaps one-quarter wavelength long will be mounted on a non-radiating tower several hundred feet high. Instead of several tall vertical towers, an FM directional antenna will merely be a collection of several individual FM antennas mounted on top of a single, tall tower.

In AM, where quarter wavelengths are quite long, an error of a foot or two rarely makes a tremendous difference. In FM, an extra few inches can wreak havoc with antenna tuning, VSWR and radiated power, and may cause many other operating problems.

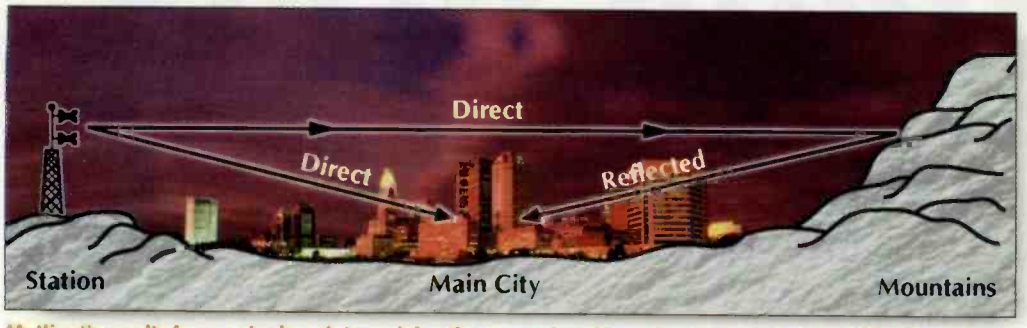
A higher frequency means a smaller wavelength. Because of this, an FM antenna can be only a few feet long instead of several hundred feet, like an AM radiator. (Photo courtesy of Propagation Systems Inc.)

Propagation

In AM, the RF energy leaves the antenna vertically polarized. This

polarization was selected because it was determined that this form of radiation usually produces the greatest distance to the desired service contours. The AM signal is influenced by the conductivity of the ground over which it passes. In general, the moister the ground, the farther the signal travels before being greatly attenuated. Thus, the ground wave is used in AM. In general, vegetation does not have too severe an effect on coverage, unless it is very close to the antenna and power is wasted heating trees and other vegetation close to the antenna.

In FM, there is effectively no ground wave. We rely on *line of sight* transmission for efficient operation. Thus, we seek antenna height above ground to ensure the best signal delivery possible. The FM signal can be heavily attenuated by trees and the growth of vegetation in the signal's path, especially in the area adjacent to the transmitting antenna.



Mutlipath results from a single point receiving the same signal from two or more sources. The direct signal is usually the strongest.

The FCC originally specified horizontal polarization for FM. This appears to have better rejection of automobile ignition interference, which incidentally is often located in the 7MHz region. About 30 years ago, a number of FM antenna manufacturers experimented with *circular polarization* (CP) and perceived several benefits from its use. The FCC then changed the *Rules* to allow either horizontal or circular polarization.

The commission allows equal horizontal and vertical powers in a CP operation. The vertical power may never exceed the horizontal but may be any ratio up to that point. The use of CP does not increase the ERP, and all contour calculations are made using the horizontal power only. Remember that the vertical and horizontal signals do not occur at the same time at the point of reception. That is why CP does not increase coverage contours but merely increases power density at a given point. It is important to remember that, when calculating the effects of non-ionizing radiation for FCC applications, the vertical and

horizontal power have to be added together when using the tables.

The use of CP provides other advantages as well. One is increased power density in a reception area. Another covers automobile antennas: Some are vertical, some are horizontal, and some combine both polarizations. The same goes for home listeners whose receivers use the power cord as an antenna. Regardless of the orientation of the power cord, some sections will be more or less lined up with the arriving signals. This provides better signal penetration.

When CP was first touted for television, one of the improvements cited was better reception in mountainous regions and in areas with tall buildings. The arriving signals supposedly are easier to select. Because the visual distortion problems trouble TV viewers' eyes far more than aberrations in FM trouble listeners' ears (aural anomalies are far less noticeable), CP appears to show less effect in easily observed FM improvements. Nevertheless, CP for FM is the norm today, and vertical FM polarization alone is now usually found only in educational FM stations with channel 6 TV interference problems. Here it usually gives a 6dB improvement in interference rejection.

The FM signal can be heavily attenuated by trees and the growth of vegetation in the signal's path, especially in the area adjacent to the transmitting antenna.

Air is an excellent dielectric; one might expect little loss in a normal path. Yet, the fact that the wavelength is short can cause path characteristics to have strong effects on FM signals. Apart from regular attenuation caused by signal absorption, the very high frequency FM signal tends to be affected by optical laws that can introduce unwanted and unexpected reflections, resulting in signal cancellation and other out-of-phase effects.

Reflection of FM signals can be useful or can almost ruin a transmission. Probably the greatest problem is *multipath*. Multipath results when several objects cause reflections that produce signals with varying phase and amplitude at a receiving antenna. This effect can stem from an improperly located antenna that leads to reflections from a cliff face or buildings. The result is weak or distorted signals at a given receiver location.

Multipath is often noticed in moving car radios when a signal is heard as a series of short bursts. The effect is that of running a stick along a picket fence. For this reason, the phenomenon is usually called picket fencing. Multipath is caused by the arrival of in and out of phase signals that add and subtract from the perceived signal. Rarely, a similar effect may be found quite close to an FM antenna. In this case, however, the effect is caused by numerous nulls that can exist near an FM antenna. Careful antenna design and mounting usually take care of the problem.

On the other hand, another effect, refraction, can sometimes assist FM reception by bending an FM signal over or around an obstruction. An effect known as *knife-edge diffraction propagation* often occurs when an FM signal passes over a steeply sloped obstruction with what is effectively an edge at the top (i.e., a very sharp mountain peak). This effect is produced by a slowing down, almost a crowding, of the signal as it passes over the knife's edge. This slightly changes the direction of travel in a downward direction. The result is a signal that seems to bend at that point and angle down on the other side of the mountain, thus providing service to an apparently shadowed location. This effect is often employed to provide FM service in the western part of the U.S. that, according to the *Rules*, cannot be covered.

By adding additional radiating elements, the radiated beam is narrowed and provides increased power gain. (Photo courtesy of Antenna Concepts.)

Height is the most important consideration when locating an FM antenna. The antenna's height above ground is not as important as its *height above average terrain* (HAAT). The *FCC Rules* specify that HAAT is calculated by drawing at least eight radials for a distance of 10 miles from the transmitter site. The *Rules* cover the operation, but it is important to remember that only the distance from 2 miles to 10 miles is averaged to obtain the average elevation of the radial. The radial averages are then added and again averaged for the overall average elevation.

The final operating height used for calculation is the height of the antenna above the average terrain. There is a weakness in the rules because, quite often, the terrain between the 2-mile and 10-mile points is not representative of the terrain much farther out. The *Rules* take care of this problem by providing a terrain roughness factor to account for unusual terrain.

One of the problems associated with FM antennas is that the signal is radiated in a beam, like a searchlight. A single FM antenna (one bay) has a radiation pattern that is broad vertically and horizontally. As the antennas increase in number, they are stacked one above the other, the vertical dimension of the beam decreases, and the amount of power radiated equally around the antenna (assuming that the antenna is not directional) increases. This is the secret of FM antenna power gain.

Unlike AM antennas, power gain in FM antennas comes from narrowing the radiated beam. This leads to a number of problems. Next month, we will examine methods of increasing power gain and their effect on antenna performance and coverage.

This is the seventh in a series of nine articles on basic broadcast antennas. Upcoming installments will appear monthly in BE Radio *through 1999. Once all the installments are published, the series will be available for purchase as a single document. For information regarding bulk orders of this series in quantities of 500 or more, contact Jenny Elsele at 913-967-1966.*

E-mail John at: batcom@bright.net.

New Products

Compact amplifier
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P1000 Trans-ana: Designed for broadcast studio monitoring, recording or critical listening, headphone-system amplification, surround-sound applications, paging systems, balanced or unbalanced use and 115V/230V requirements. Circuitry is based on TRANSconductance Active Nodal Amplifier topology, which operates the output stage with full voltage gain, allowing the input stage to operate from a low-voltage regulated supply. Signal is then increased to the high-voltage section by the driver stage.

888-HAFLER1; fax 602-894-1528; www.hafler.com
Circle (254) on Free Info Card

Orecast concrete buildings
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EASI-SET buildings: Provide a secure, durable and watertight environment for equipment. Install in hours allowing for the installation of new equipment and transfer of service without downtime for the customer. Creates a virtually bulletproof unit for sensitive electrical controls, maintenance equipment storage, communications and mechanical housing. The units meet UL752 level 4 bullet resistance. The design withstands Zone 4 seismic and a minimum wind load of 130mph. The roof and floor are specially post-tensioned, making the design impact-resistant and impervious to moisture penetration.

800-547-4045; fax 540-439-1232
easiset@mnsinc.com; www.easi_set.com
Circle (252) on Free Info Card

MPEG tapeless recorder
You/Com Audiocommunicatie

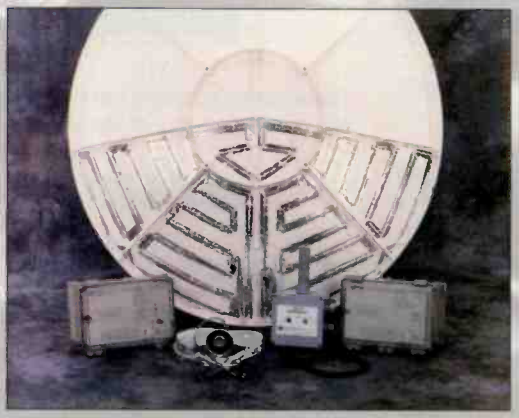
ReporterMate MTR/64x: Enables a reporter to move from one location to another while sending news directly to the studio. Transmits the news with the touch of a button after the reporter connects the mobile phone to the ReporterMate and calls the studio. The standard FTP protocol implemented in the unit has a built-in error-check mechanism that guarantees the contribution reaches the studio at the highest quality. In an emergency, the audio can be played out live via a special connection to a mobile phone that allows a complete four-wire connection to be made with the studio. Can be used for playing reports over ISDN, POTS, Internet or satellite networks.

+31 15 262 5955; fax +31 15 257 1595; mmeulen@youcom.nl; www.youcom.nl
Circle (261) on Free Info Card

Composite processor
Solid Electronic Labs

Model DCP-1A: Performs the functions of instantaneous limiting and composite low-pass filtering in a single structure, thereby permitting maximum loudness, filter overshoot control and dynamic range. The design employs an active linear amplifier as the limiting device; its filter structure is configured in two separate sections, each with its own overshoot compensation circuit. Front-panel LED indicators allow direct indication of clipping level, input level and overshoot compensator threshold levels.

610-353-9449; fax 610-356-8449
Circle (257) on Free Info Card



Antenna deicing system
Environmental Technology

Safe Heat: Accommodates most satellite antennas up to 10m apertures, including feed components and subreflectors. Systems include all heaters, electrical controls, a Snow Switch automatic controller and interconnecting wiring. Available power densities vary from 40W per square foot to 140W for anti-icing. Systems operate from 100V single-phase to 480V three-phase, depending upon antenna aperture size and customer preference. The heaters are CSA-certified and NRTL-recognized.

219-233-1202; fax 219-233-2152
helpdesk@networketi.com; www.networketi.com
Circle (256) on Free Info Card

Digital console
Soundcraft Electronics

RM1d: Operators familiar with an analog desk will be able to use the unit without a learning curve. Available in two frame sizes, a six-fader model and a 12-fader-plus-script-tray frame. A 12-fader input extender sidecar is available, enabling varying numbers and different physical layouts to be accommodated. A pool of digital and analog inputs is provided, which can be assigned to any fader.

615-399-2199; fax 615-367-9046
www.soundcraft.com
Circle (262) on Free Info Card

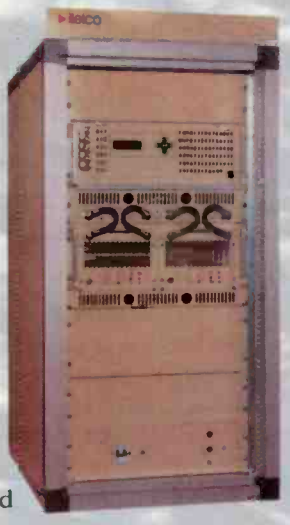
Desk systems
Middle Atlantic Furniture

Edit Center Desk: Adaptable design can be quickly configured to suit a diverse range of preferences. Offered with a choice of two attractive high-pressure laminate tops (cherry or graphite), the systems combine the aesthetics of custom furniture with the convenience of configured

system ordering and quick shipping from stock. The central desk measures 60 or 84 inches wide and includes an overbridge in one of two styles, either with equipment bays underneath or with an open span between the supports. Pivoting speaker platforms are supplied with both overbridge models. A built-in cable-management system accommodates the company's power strips.

973-839-1011; fax 973-839-1976
www.mlddleatlantic.com
Circle (260) on Free Info Card

DAB transmitter
ITELCO USA Inc



DAB L-Band Transmitter: A complete series of DAB transmitters for the L-Band up to 800W RMS output power. Power amplifier modules use high gain (GaAs) FET technology for the driver stage and final amplifiers in Class AB (BJT devices) to ensure high linearity and efficiency, the 50W transmitter is available with final amplifiers in Class A operation. Itelco power amplifier modules require no tuning and are self-protected against RF input overdrive, overcurrent, maximum VSWR, overtemperature and internal overvoltage. Every module has its own power supply (AC/DC converter) and can be operated stand-alone.

303-464-8000; fax 303-464-8770; itelco.sales@krenet.it; www.itelco-usa.com
Circle (250) on Free Info Card

AM/FM stereo tuner
Denon Electronics

TU-1500RDP: Highly sensitive reception provides detailed, clear sound, even in crowded areas. Four-stage variable capacitors in the product's front-end guarantee accurate tuning of station frequencies. Drift is eliminated via use of a large-capacity microprocessor in the tuning section. Employs a low-impedance output circuit that enables high-quality signal transfer to the amplifier and ensures an open, transparent sound with minimal distortion in the high frequency range. The low-impedance output circuit also protects the signal from externally induced noise to further improve the sound quality. RDS services can be read on the tuner's display at up to 13 characters at one time.

973-575-7810; fax 973-396-7459
www.del.denon.com
Circle (258) on Free Info Card

CD recorder/player
HHB Communications

CDR850: Now available in a PLUS version for use with systems in all-digital applications. The addition of a word-clock input enables the unit to be locked to a master-clock source during playback. A set of dip switches on the rear panel enables the unit to reference its master-clock source not only via the word-clock input but also via its AES/EBU digital input, the coaxial and optical SPDIF digital inputs, or its own internal clock.

+44 181-962-5000; fax +44(0)181-962-5050
sales@hhbusa.com; www.hhb.co.uk
Circle (255) on Free Info Card

Business/People

Business

Harris and **Pacific Research & Engineering** have jointly announced the signing of a definitive agreement for Harris to acquire PR&E through a cash tender offer that values PR&E at approximately $9.5 million, including the assumption of debt. The boards of directors for both companies have unanimously approved the transaction.

Andrew announces that it has added manufacturing capacity at its new Global Broadcast Headquarters in Tinley Park, IL. The 36,000 Square-foot facility houses administrative, production and research and development facilities for Andrew range transmission line and antenna products for global broadcast markets.

RDA Systems has been named a Klotz Qualified Systems Integrator by **Klotz Digital Audio**. RDA Systems has successfully implemented radio upgrade and consolidation projects of all sizes across the U.S. RDA has been factory trained and authorized to specify, install and set up Klotz digital audio systems.

Wheatstone reports a record number of sales, covering a wide range of console sizes, needs and models. Purchasers of Wheatstone consoles include CBS-owned KLRA in Los Angeles, which is on-air with an A-6000; KMPS, the CBS station in Seattle, which has two A-6000s on-air as well as three A-300s and three Audioarts Engineering R-60s; and WBBF, in Rochester, NY, which has ordered two A-5000 consoles.

Klotz Audio Interface Systems GmbH has announced its cooperation with the TAG Technical Audio Group from Sydney, Australia, as a Pro Partner for the Australian broadcast, television, studio and event-technology market. TAG is one of Australia's leading full-line suppliers of professional audio equipment, specializing in concert touring, installed sound reinforcement, studio and broadcast markets.

Wall Street Communications, a marketing communications agency specializing in video and broadcast equipment and electronic components accounts, today announced that it has opened an Asia/Pacific headquarters office in Singapore, the first location for the agency outside the U.S.

People

Prophet Systems Innovations has announced the addition of **Ross Flaven** to its professional staff. Flaven will be working on all levels of documentation for NexGen products, including installation and maintenance manuals.

Travis Harris, formerly domestic sales assistant for Broadcast Electronics, has been promoted to senior account manager for the Mid-Atlantic region. Harris will be responsible for sales in the states of Ohio, Kentucky, Virginia and West Virginia.

Also at Broadcast Electronics, **Gill Rudolph** has been hired in the its studio systems customer service department. The addition of Rudolph to the department is part of the company's effort to continually anticipate the needs of its growing customer base.

Theron Hayse has joined Broadcast Electronics as senior account manager. In this capacity, Hayse will be responsible for sales in the South Central region, which includes the states of Colorado, Nebraska, Kansas, Missouri, Oklahoma, Texas, and New Mexico.

DAB UPDATE

USA Digital Radio and **Kenwood Corporation** have signed a joint technology and marketing agreement. Under the agreement, the companies will further the implementation of In-Band On-Channel digital audio broadcasting. The privately held companies will work together to develop, test and promote IBOC DAB receivers for consumers, including developing coordinated strategies for the market launch of IBOC technology and associated Kenwood products.

Ford Motor Company and **CD Radio** have announced an alliance to bring digital satellite radio to Ford customers. Ford's partnership with CD Radio will bring Ford customers an entertainment service that will include commercial-free music and seamless, coast-to-coast U.S. coverage. The exclusive agreement includes all Ford brands. The company plans to begin installing CD Radio receivers as early as first quarter 2001.

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Digital maintenance

By Skip Pizzi, executive editor

You might have thought that maintenance of radio stations would remain unchanged in the transition from analog to digital facilities. Someone will always be needed to keep mission-critical, 24/7 broadcast systems running, right? While this is true, the nature of the work, as it turns out, is dramatically different from that required at analog stations.

First, there has been a shift in the need for routine maintenance. With no tape decks, cart machines or turntables to mechanically and electronically align, hours of regular preventive maintenance (and its associated studio downtime) are largely a thing of the past. This may mean a reduction in shop personnel time. Modern transmitter equipment has also become extremely stable and includes substantial automatic and remote controllability, further reducing overall staff time in this area.

In contrast, the radio station has never been more vulnerable to a complete shutdown due to equipment failure at its studios. A computer-networked operation can be brought to its knees by a single, strategically placed bug. This can render a station — or a group of stations in a co-located, consolidated facility — silent, while their transmitters dutifully continue to fill their channels with dead air.

Thus, while the need for routine maintenance has declined, its need for staff to respond to urgent needs has increased. This is a difficult situation to accommodate, but many stations are beginning to tackle it strategically.

Staff vs. contractors

One process that has had some early success involved both a division and combination of forces. Consider that most RF elements of the radio station remain pure radio technology, while studio equipment is leaning away from the traditional audio environment and moving toward the computer realm. Management of these components therefore continues to diverge in philosophy and style.

A basic premise of this approach is the delegation of RF plant maintenance to contractors, allowing on-staff maintenance to be more computer-specific. In a sufficiently large or consolidated facility, this separation comes in the form of distinct positions for RF maintenance and computer support. Contractors can be used for on-call support of these staff positions during peak periods.

There is potential for great synergy between these two staff positions, with each learning more from the other over time. Unfortunately, the markets for these positions vary significantly. The RF maintenance position is relatively stable in a mature and contained market, while the computer support industry is broad and is currently experiencing explosive growth. Competition for media-oriented, computer-support managers extends beyond the radio industry, to companies large and small, local and national. Finding such a person and keeping him or her on the radio-station payroll is therefore quite a challenge.

The radio station has never been more vulnerable to a complete shutdown due to equipment failure at its studios.

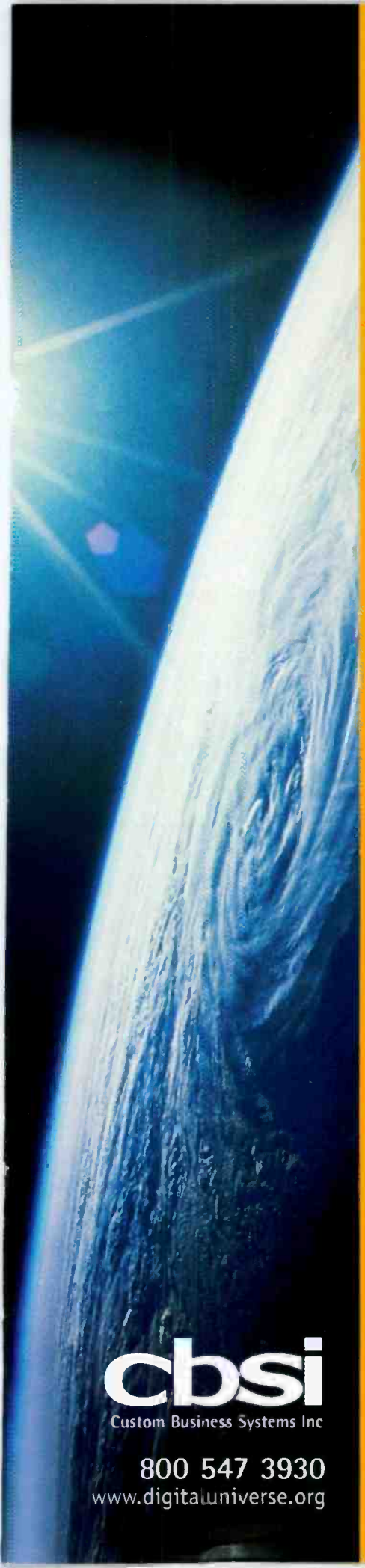
In smaller markets, all maintenance may already be delegated to contractors. Here, the likely solutions involve either making the operations manager into a computer-savvy position or relying on contractors for computer support. The latter is risky, particularly given the worst-case crash scenario noted above, but may work well in certain cases. Because computer skills have become essential in the radio industry, many broadcast maintenance contractors are increasingly adding a specialization in computers to their repertoires.

Growing pains

Focusing on RF and computer technologies may leave the traditional audio elements of the studio lost in the middle. Audio is, after all, the ultimate product of the radio station, and someone needs to be concerned with it above all other duties. In some cases, production managers can handle this task, dealing with some issues themselves, identifying and delegating others to other appropriate specialists for repair or redesign. In other cases, the RF staff or contractors can handle the responsibility adequately, interfacing when necessary with the computer specialists.

Another contentious issue in larger operations is the management structure for these revised maintenance duties. One solution involves reinventing the engineering department as a technology group led by the organization's chief technology officer. Separate departments inside this group will handle RF, audio and computer-based specialties.

Many solutions will be specific to each organization. What's certain, though, is that staff and corporate structure changes *will* be required to optimally maintain the computer-based radio facility.



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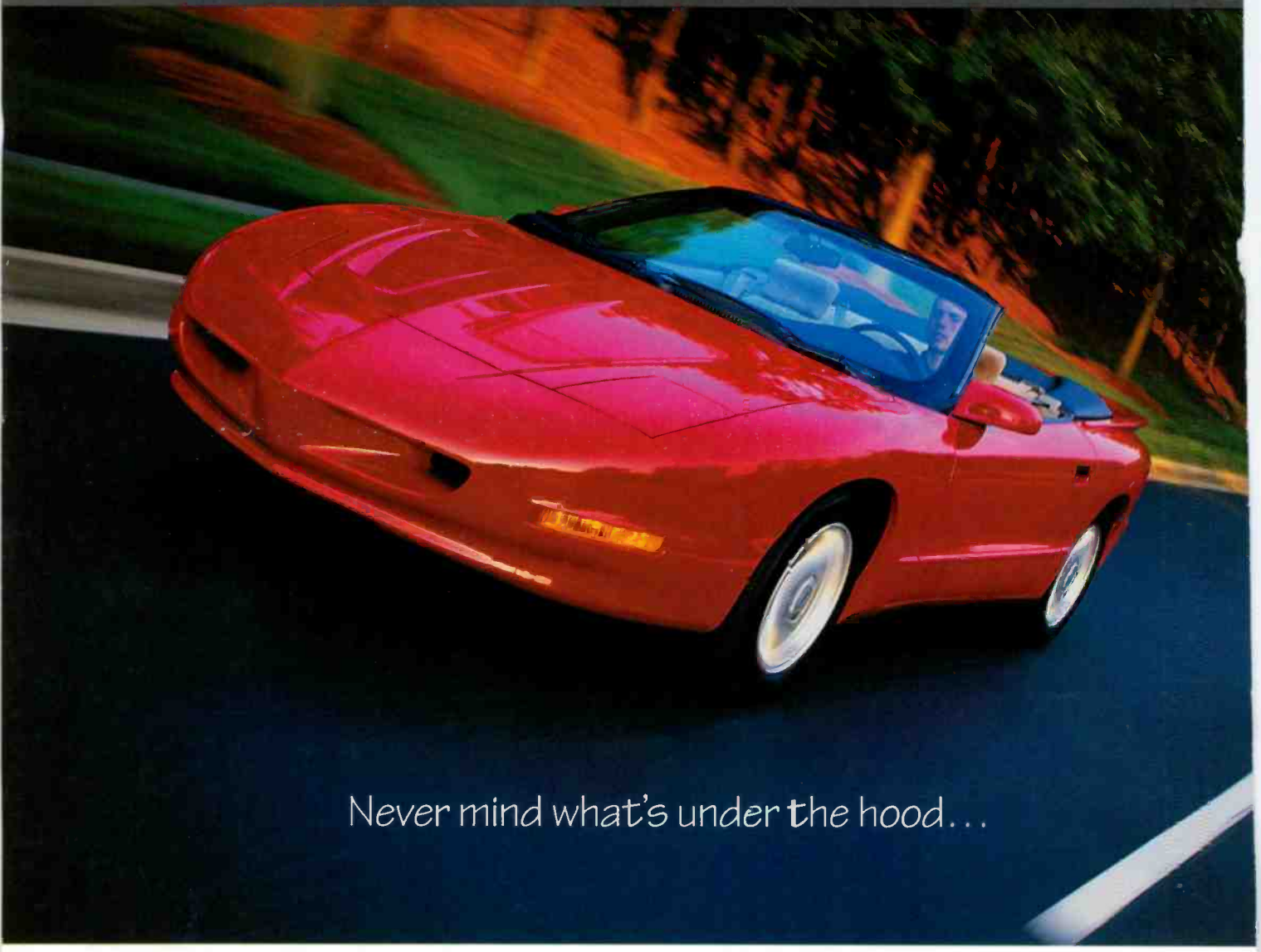

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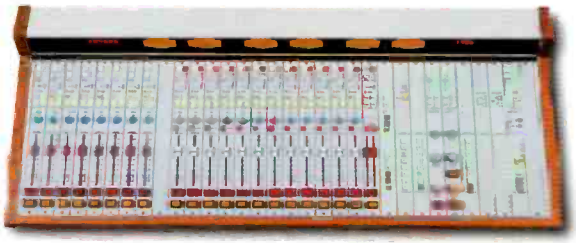

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