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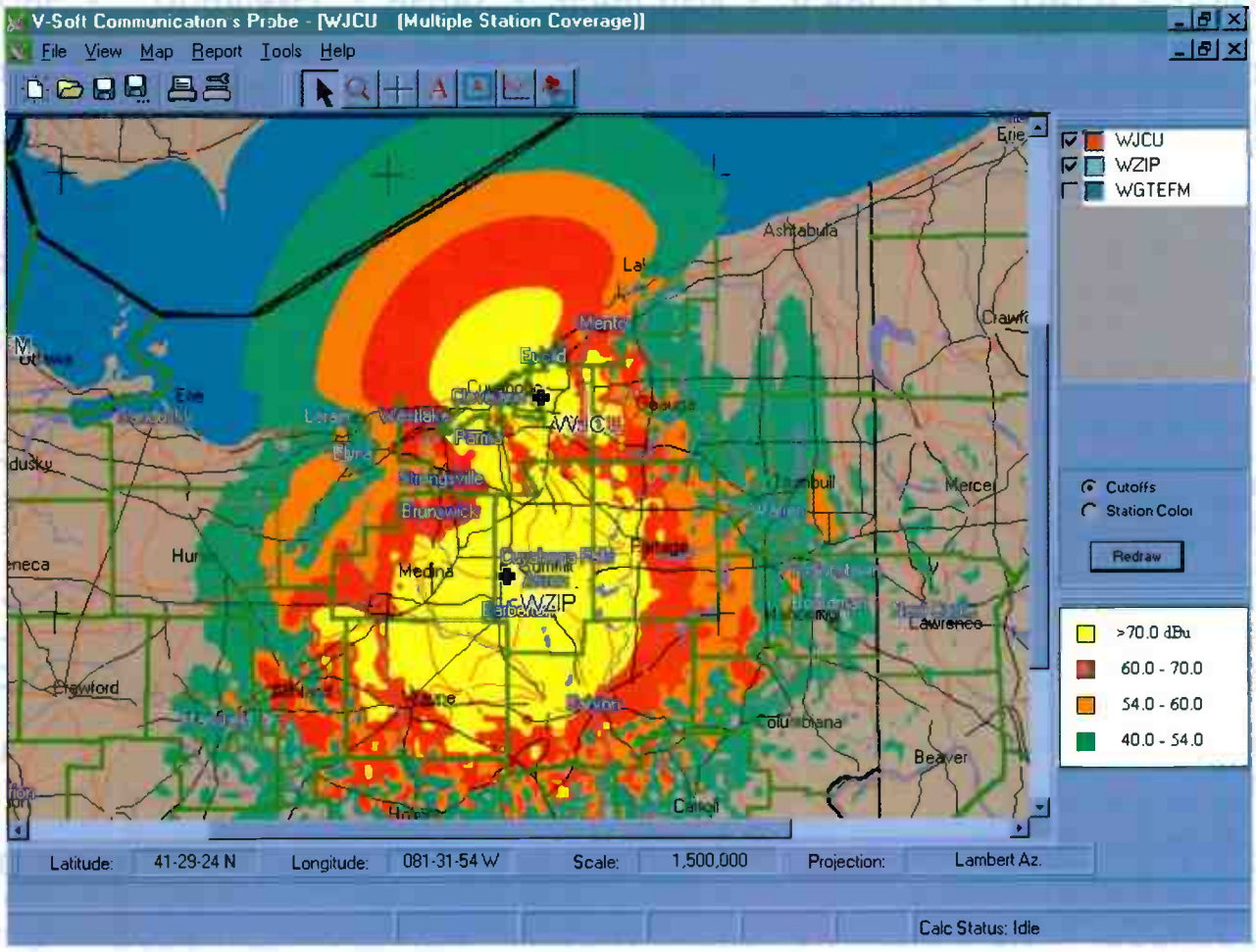

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Viewpoint

The envelope, please

Many of us have plenty of things we really don't need. Mattress tags. Electric shoe polishers. Tasteless neckties. The pink envelope of EAS Authenticator Codes.

The FCC has done away with the pink envelope. The item that originally sat in the pocket of the orange EBS checklist and carried over to the EAS standard has been abandoned. Finally.

The Emergency Alert System (EAS) is going into its third year of operation. The EAS concept is markedly better than the EBS (which, of course, was better than Conelrad, but that's a conversation we have all had at SBE meetings). While its execution has been less than perfect, and many areas do not yet have the details together, the potential benefits are clear. (Never mind the pleasant sound of the data bursts for now.) The system can be automated to warn the listening public of emergencies and disasters almost as quickly as the information can be entered into the system from an emergency management office or, if need be, the White House.

When properly implemented, the system flawlessly passes information. This level of performance is vital when an instant can make a substantial difference. Some types of activations, like an Emergency Action Notification, require no manual intervention. Some Operational Area plans also call for certain weather-related messages to be immediately relayed. For some of the more routine situations, a station operator can simply forward the message within a specific time window.

The authenticator codes in the pink envelope were to serve as a safety measure for national emergencies. In the EBS standard, there was an obvious place for this step, which was intended to keep someone from creating a false message and taking over the system.

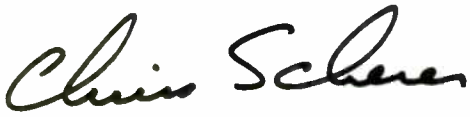
For EAS, this step does not exist. The appropriate FIPS codes are set to automatically and instantaneously relay the emergency information. The pink envelope was unnecessary. (Besides, most operators had no clue what to do with the envelope anyway — despite all the memos and training they had received.) To verify a message's authenticity, the operator had to open the envelope, find the correct code words and decide if the pending situation were a real emergency. Whoops. By the time the operator has determined whether or not it's an emergency, the message has already entered the system and has been transmitted to the world. It's too late to do anything about it; the damage is done.

This is not to say that the EAS is flawless. There is still the possibility of breaching the system, but elimination of the pink envelope was a good step. The envelope was an antiquated effort that no longer had a useful place with the new system. The FCC's elimination of some requirements has been unwise (like operator licenses), but this is not one of them. Besides, most of the envelopes at stations were probably out-of-date anyway.

Other improvements could also be made. The EAS was built around the WRSAME alert codes of the National Weather Service. Since EAS was adopted, these codes have been modified. The EAS codes and SAME codes need to work together. National Weather Service, an integral part of many EAS Operational Area plans, must work with the LP stations to provide accurate, understandable information, and the NWS stations must also understand their role in the process.

Another area for improvement deals with educating the air staff. I'm sure you have already spent a considerable amount of time teaching your staff the details of EAS. Most operators, however, still look at it as an unnecessary waste of time. I continue to hear weekly and monthly tests that are less than perfect.

As the FCC undergoes its own self-inspection process, it will no doubt find other potential improvements in more areas than just EAS. Eliminating the pink envelope was a good step. Others need to be taken.



Chriss Scherer, editor

A complete EAS update will appear in the February issue of BE Radio.

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Computer maintenance

By Kevin McNamara, CNE

It's a new year and, if your responsibilities include handling the company PCs, this may be a great time to establish a preventive maintenance program for your growing list of desktop, laptop, network and server computers. With facilities owning upwards of one hundred systems these days, it's almost impossible for time-strapped engineering departments to keep up a proper maintenance routine. PC maintenance falls into three basic categories: 1) physical maintenance; 2) preventive maintenance; and 3) maintaining sufficient and current configuration information to recover from crashes.

Physical maintenance is not as common as other tasks, but hardware upgrades can be routine. Always document any system changes.

Physical maintenance

The actual physical maintenance required for a PC is minimal, since the mechanical devices are not generally serviceable in the field and, in fact, are usually cheaper to replace. The primary goal is to be sure there is enough airflow through the cabinet. Unless the system is sitting in an environmentally controlled space, chances are the cabinet is loaded with dirt and dust. After removing the cover (turn off the power first), use canned air for clearing dust from the cabinet interior and motherboard (especially the cooling fins on the CPU). If the CPU has a cooling fan attached to it, make sure it still works when power is applied to the system — these never seem to last long. You may also want to remove and reseat each plug-in board. Do the same for any other plugs, such as those attached to ribbon cables.

Hard-drive basics

Most PC problems result from the loss or corruption of data on the hard drive. By most standards, hard drives are very reliable, but they are still mechanical devices with a finite life. If the CPU is the heart of a PC, the primary hard drive is its lungs. Though space doesn't permit a thorough discussion of hard drives, it is important to understand how data gets corrupted under normal conditions.

When a hard drive is formatted, small sequential areas, called *blocks*, are created. The capacity of the drive and the operating system's formatting options determine the amount and size of the blocks. When files are copied to the disk, they are parsed into smaller segments that fit into these individual blocks. If the drive is relatively empty, the data may be written to contiguous blocks. However, as the drive fills up and files are modified, added or deleted, the blocks of data containing a file may be scattered around the drive. This is called *fragmentation* and leads to errors and slow performance.

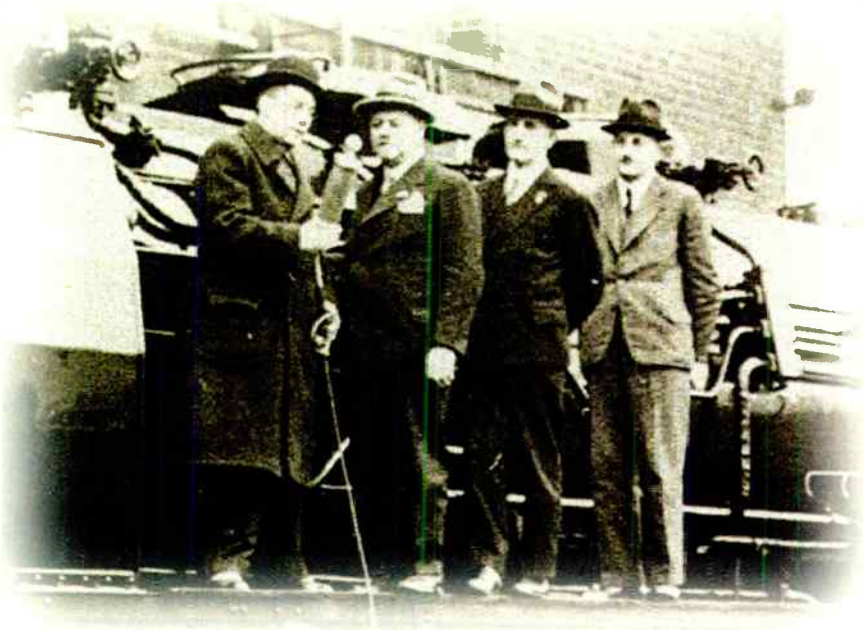
Hard drives reserve several blocks for the file allocation table (FAT). The FAT keeps track of the specific blocks that make up a particular file.

Operating systems like Windows 95/98/NT make extensive use of the primary (boot) hard drive. They also uses a large portion of the drive (usually the boot drive) as additional "swap" memory in addition to the system's RAM. Damaged blocks used for swap memory can slow system operation and will likely cause a system crash. Also, any of the operating system or system support files (i.e., configuration or device drivers) stored in damaged blocks will also cause a system crash.

Drives used for audio storage and production purposes tend to have the most potential for damage because of their extended usage and many read/write operations.

Preventive maintenance

Your best line of defense for recovering any critical files is through the regular use of backups. A reasonable high-capacity backup drive can be purchased for as little as $150. Backups of all critical data should be made once a day, then transported to an off-site location. If you have any T1 links between the studio and a transmitter (or another studio site) you can transmit the information to a remote PC at that location. Windows 95/98 comes packaged with a set of disk-repair and diagnostic tools. Also, several inexpensive, third-party software products provide disk maintenance as well as powerful system diagnosis, repair and performance-tuning functions. These utilities can be scheduled to run automatically, such as



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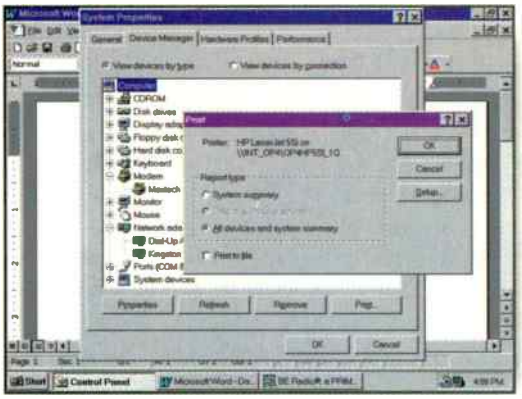
overnight. They also provide a set of timesaving tools that permit you to create specialized backups of critical system areas such as the following:

- For troubleshooting, *recovery* disks to boot your system without the hard drive.
- *Image* of the hard drive's FAT to recover a damaged drive.
- The system BIOS and hardware-configuration settings.

Make these backups for each machine and keep them labeled, updated and stored in a safe place. Some day, you'll be thankful.



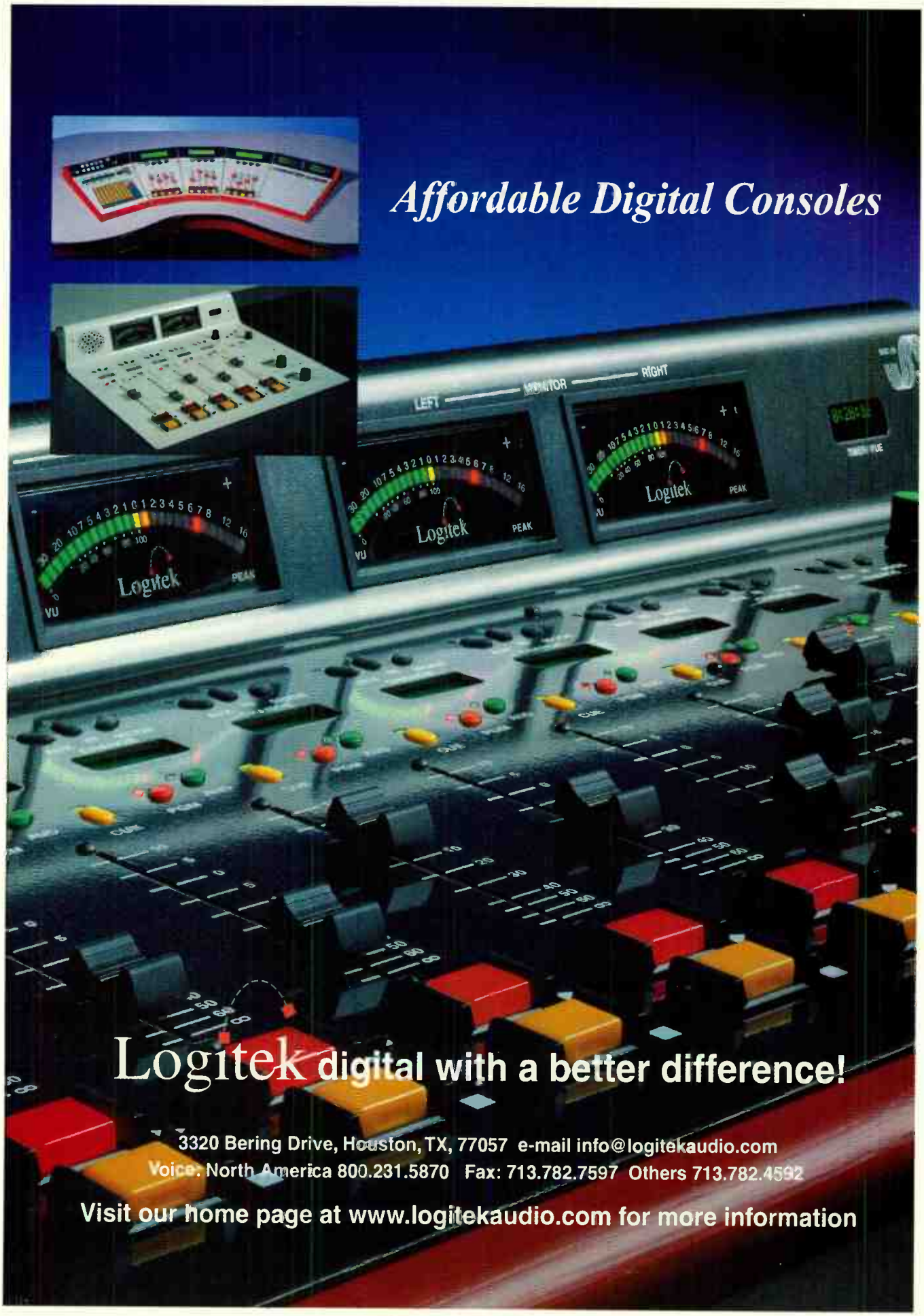
A detailed report of the system's settings and parameters can be invaluable for keeping systems running.

Document your systems

Individual folders can be used to maintain system information. Identify and document all PC systems and significant external devices (e.g., printers, monitors, drivers, UPS). If you don't already maintain current records, this will be the most time-consuming step, but it will save you aggravation when the time comes to repair a unit. Use a simple form to record the basic unit information such as type (e.g., PC, printer), make, model, location, primary user and other pertinent information. Next, print the detailed system information, either from the *system* panel (in Windows 95/98) or use one of the above-mentioned utility programs. This printout will give you written documentation of the PC configuration and specific information about the various plug-in cards.

Keep the forms and printout in individual folders for each PC and server. You may want to keep the individual system recovery disks in the respective folders as well. You can also keep original manuals, copies of invoices and records of the software used on the individual units in the folders as a way to track software licensing information or maintain version data. It is always possible to use either one of the many system-documentation databases available to record the same information, but I've found that having all the historical documentation in one place is much more efficient.

Kevin McNamara, CNE, BE Radio's consultant on computer technology, is president of Exegesis Technologies, a consulting firm in New Market, MD. He can be reached at (888) EXE-GESIS; e-mail: exegesis@unidial.com.



Prepare for an emergency

By Kirk Harnack

Broadcast engineers respond and react to emergencies every day. Problems may range from a roof leak at the transmitter to recovering the program director's favorite Internet links in his browser. Addressing urgent problems — both important and not so important — is a necessary skill for successful engineers.

Plan the strategy

One of the most common emergencies broadcasters face is loss of electrical power. Most stations in the largest markets are equipped with backup power generators. It's easier to justify the cost of a generator when half an hour of lost airtime can result in $100,000 or more in lost revenue and can affect station ratings. Medium-sized and smaller markets often have a more difficult time justifying the cost of a backup power generator. This is especially true if commercial AC power is fairly reliable and the prospect of being dark for an extended period seems remote.

A weather-related emergency is just one situation for which you should have contingency plans in place.

What would your station do if commercial power were out for a week — or even a month? It can, and does, happen. Even if a generator is installed or available on loan, can it handle the load and operate continuously as long as necessary? What about generator power at the studio and perhaps an STL hop site? Some radio stations require AC power at three or four separate sites in order to be on the air.

By and large, engineers are aware of and concerned about emergency and disaster preparedness, especially as it impacts equipment, facilities and redundancy. But there is also the people factor. In a disaster, would your fellow employees know how to keep themselves from harm? Injured or missing staff members can't help the station stay on the air or provide on-air disaster relief.

When developing an emergency plan, keep in mind the station's goal: to maintain a high level of on-air service to our communities during and after the emergency.

True emergencies are not everyday occurrences. That's why determining risks and planning responses beforehand are important steps. The American Red Cross outlines four basic steps common to all disaster-planning efforts. Adjusted slightly to address the particular concerns of the broadcast industry, the plan comprises the steps listed below.

Determine likely disaster scenarios

Scenarios may include the following: extended loss of electrical power at studio, STL relay or transmitter sites; wind damage to studio roof, STL tower, and transmitter building roof or transmitting tower; water damage from localized or widespread flooding; heavy snowfall or accumulation of snow over time; ice accumulation on towers and antennas and subsequent ice shedding; severe lightning damage; and fire at an office, studio or transmitter site.

A building evacuation plan should be part of the overall disaster preparedness program. And, with any scenario, the safety of employees must be paramount.

Create a disaster plan

Meet with station department heads to discuss disaster preparation. Determine the most likely disaster scenarios, and set goals for basic levels of broadcast service both during and after a disaster. Formulate plans for safely meeting those goals.

If several consolidated stations are involved, prioritize which ones will receive the highest level of attention. Make sure all departments agree on a hierarchy for reviving off-air stations.

Pick two places to meet if the disaster warrants vacating the building. One location should be outside the office or studio facility. The other should be a specific part of your city or county in case employees can't return to the office.

Write guidelines for dealing with disasters. Include a list of general instructions, and designate it required reading

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for all station employees, including part-time staff. Include specific information, such as key telephone numbers and reminders about hazardous conditions. In these guidelines, make it clear that employees should not put themselves in danger during an emergency or disaster. Include guidelines about supplies, such as where stores of food, water, blankets and first aid supplies will be kept.

Keep an up-to-date list of each employee's home phone, pager and cell phone numbers. Place the list at the front desk next to the fax machine. Attach the most recent list to the disaster plan guidelines.

Make a checklist

Your checklist may include the following items: 1) Update the disaster plan, distribute copies to every employee, and post in key areas, including control rooms, the kitchen and the engineering shop. 2) Review the disaster plan with employees at semiannual meetings. Identify employees with special skills (e.g., CPR and first aid certification) or equipment (e.g., a four-wheel-drive vehicle). 3) Show staff how to turn off and restore electricity, natural gas, and water to studio and offices. 4) Review insurance coverage, especially when purchasing or consolidating facilities. 5) Check fire extinguishers. 6) Stock emergency supplies for personnel who may be stranded at a studio or transmitter site. 7) Annually, invite a Red Cross representative to speak about disaster management. 8) Discuss escape routes and evacuation procedures. Include weekend and overnight staff in these discussions. 9) Designate safe places in the studio and offices for different types of disasters. 10) Semiannually, have engineering staff perform reviews of equipment preparedness and thoroughly test generators, fuel systems, backup studios, STLs, transmitters and antennas.

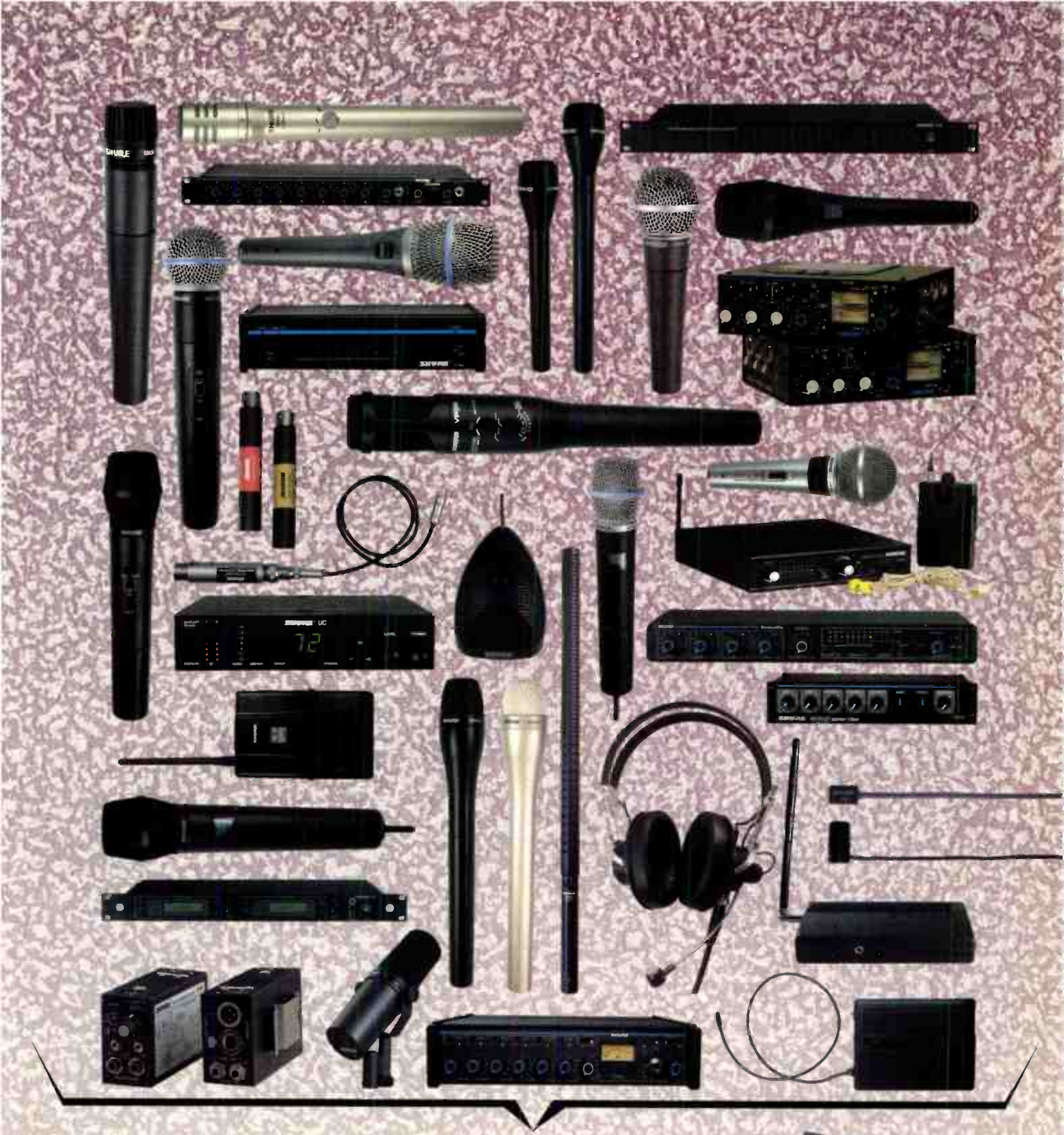
Review the checklist twice a year, and report to management any shortcomings in the disaster plan.

Practice your plan

Most people think they would know what to do in an emergency. However, nothing can substitute practice, and evacuation drills may point out problems never before considered.

Disaster and emergency preparedness is like good insurance: You don't realize how valuable it is until you have to use it.

Kirk Harnack is president of Harnack Engineering Inc., a contract engineering firm, and is vice president of engineering for Delta Radio Inc., a Mississippi-based group of six radio stations.



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Modulation

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

Limiting the degree of modulation to prevent overloading power tubes with the distortion that results in adjacent-channel splatter led to the development of methods for measuring modulation. Thus modulation monitors came into being.

As broadcasting grew, AM and FM requirements increased. Several companies manufacture AM and FM modulation monitors today. These monitors differ from the old vacuum-tube units. Their circuitry is far more complicated, but technology has made it easy to provide much more information, with facilities for remote indication and control. Today's AM monitors show 125% positive modulation and excess of 99% negative modulation, along with other refinements that were not available in the tube age.

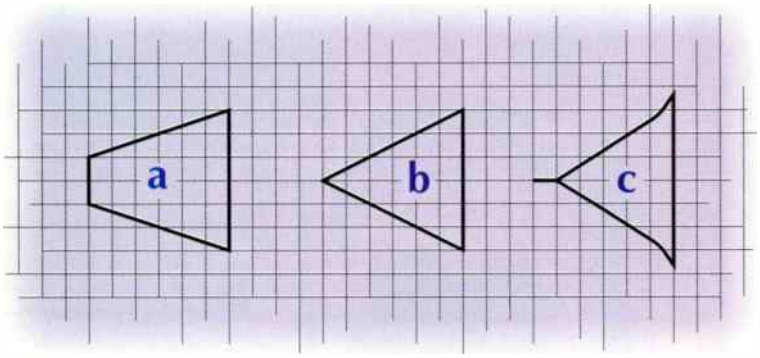

Figure 1. Trapezoid measurement of modulation.
a) 50% modulation-negative peaks indicated by side that shortens.
b) 100% modulation, pointed on negative side and twice carrier on broad side.
c) Overmodulation, nonlinearity and distortion shown by curved sides.

AM modulation

Understanding AM modulation requires knowing that the presence or absence of modulation does not change actual energy appearing at the carrier frequency. However, the total power radiated with 100% modulation is 1.5 times the unmodulated power, and RMS current increases by the square root of 1.5, or 1.225. When a carrier is modulated 100%, and the amplitude of the sidebands compared with the carrier is measured, the sidebands have half the amplitude of the carrier.

The creation of federal regulations specifying the maximum and minimum amount of modulation allowed for commercial broadcasters led to the 100% maximum and 85% minimum limits for AM broadcasting. As broadcasting progressed and audio processing improved, stations demanded more presence. The commission allowed an absolute maximum modulation of 125%, not to be exceeded under any circumstances. Further, 100% negative modulation, with its attendant distortion as final power amplifier current goes to zero, was forbidden. Figures 1 and 2 illustrate modulation on an AM carrier.

The heart of a modern AM modulation monitor is an extremely linear biased diode detector that accurately demodulates AM signals. It is important to maintain the calibration of a monitor with regular trips to the manufacturer, although it is possible to perform a reasonably accurate self-calibration if accurate test equipment is available.

Several years ago the FCC discontinued the requirement to have an accurate modulation monitor. Since that time, many stations have operated without accurate knowledge of their modulation levels, relying solely on previous transmitter settings. Undermodulation is almost always discovered after a frantic call from the program director who wonders why the signal doesn't sound as loud as it should. Overmodulation is indicated by a visit from the FCC.

FM modulation

With the introduction of stereo, SCAs and digital audio, the FM monitor has become an essential part of station operation. Accurate monitoring is essential, especially with subcarriers. The 110% modulation rule for SCA use gives a little *apparent* leeway in levels.

The FCC and CCIR's definition of occupied bandwidth of a frequency-modulated signal is that bandwidth which contains 99% of the power. The problem engineers argue about is how to measure this bandwidth when modulated by a stereo signal. Also, the more audio processing used, the greater the occupied bandwidth, and the greater the possibly of overmodulation. The Commission's rules concerning subcarrier (SCA) operation and stereo modulation standards are given in 73.319 and 73.322 of the *FCC Rules*. Normal limits of 100% modulation correspond to 75kHz deviation. Under no circumstances can modulation exceed 110%. This percentage corresponds to 82.5kHz deviation. The general rule for modulation with subcarriers is an increase of 0.5% total modulation for every 1% of subcarrier modulation.

Today, FM modulation monitors range from those that simply show right and left channel data, pilot level and overall modulation to more complex systems that allow the user to define peak values and set alarm limits. Peak-pulse duration limits can be set and counted. These are a far cry from the simple FM monitors of the past: One unit in

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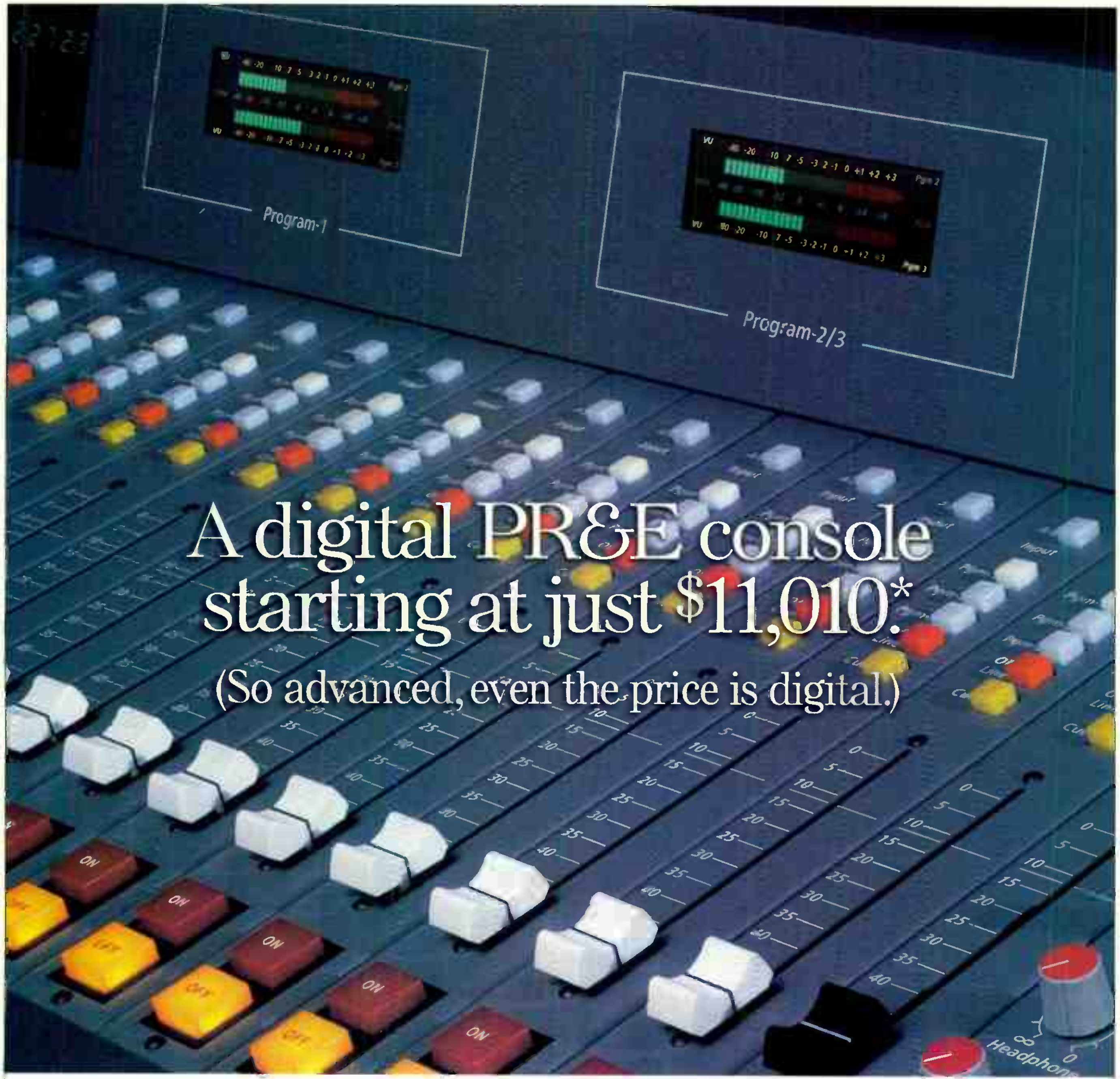

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Continued from page 16

particular can perform its own self-calibration by connecting to the manufacturer via a modem.

Digital FM stereo monitors are software-based. Digitizing the signal renders it more or less impervious to changes in component tolerances, temperature or component aging. Digital signal-processing (DSP) techniques provide very close tolerances and filtering, which eliminate phase distortion.

Some FM modulation monitor designs use a fixed oscillator that generates an offset IF signal which is passed through a limiter, then effectively converted to a square wave to provide metering information. Again, thanks to the implementation of DSP, monitors are able to capture, display and analyze more information than ever before.

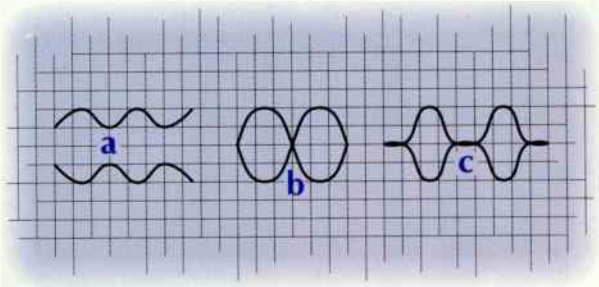

Figure 2. The AM carrier waveform with modulation.
a) RF envelope 50% modulation shown as 50% at trough.
b) 100% modulation peak power twice unmodulated power.
c) Overmodulation, cut-off, distortion and spurious radiation.

FCC engineering activities

The area of FM monitors has become increasingly complex. In 1968 the Commission issued specifications governing their design and operation. In 1983 the Commission deregulated its rules: The argument for doing so largely concerned the definition of occupied bandwidth.

In 1993 the FCC issued a Notice of Inquiry (NOI) concerning an amendment of Part 73 to clarify the definition and measurement of aural modulation limits. Information was collected, but nothing happened. Engineers are still arguing over an issue concerning the length of a monitor's response time as well as the ability to regain modulation depth that is lost when an SCA is used. Everyone is awaiting an FCC ruling that may never come.

Engineers have been discussing the problem of different methods of FM modulation measurement. Almost every manufacturer has its own circuit. The FCC uses a simple oscilloscope connected to an FM receiver's discriminator and calibrating the scope in terms of excessive deviation. The Commission has used this method for some time. The long-overdue NOI should be completed and final rules issued so all monitor manufacturers can march to the same drummer.

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DAB update

By Chriss Scherer, editor

The development of IBOC and S-DARS is moving along — this is the story you have heard for some time now. While the IBOC discussion is showing smaller advances, the S-DARS licensees are getting close to their deadlines.

IBOC

The NRSC subcommittee on DAB met in early December and approved the first of a series of documents to begin reviewing the current IBOC technology. The first wave of DAB test results was released in 1995. The data reported that the IBOC technology at that time was premature and that further work was needed. Since then, Digital Radio Express and Lucent Digital Radio have entered the field as additional independent system developers and competitors with USA Digital Radio.

The dashboard of the future? This is what XM Satellite Radio sees as the next car stereo you will buy.

The previously gathered data looked at several different types of systems, not just IBOC. The subcommittee is now focusing strictly on IBOC technology.

The guidelines allow for the fact that the three proponents are in different development stages and outline the plans for system submissions, subjective evaluations and test-result reporting. The next step for the subcommittee is to develop field-test guidelines and evaluation procedures.

S-DARS

CD Radio and XM Satellite Radio (formerly American Mobile Radio Corporation) have made numerous agreements for programming content that will fill the 100 channels each will be offering. The hardware side is also seeing developments. XMSR has agreements in place with Alpine, Pioneer and Sharp to manufacture home and automobile receiver hardware for its service.

CD Radio began deployment of terrestrial repeaters in the San Francisco area last September. The terrestrial repeater idea has always been part of the plan for the S-DARS providers, and the FCC is currently setting up the rules for these repeaters. CD Radio also began building the studio facilities for its headend in New York City last October. Satellite launches for both are planned in the near future, with services beginning around 2000.

Another S-DARS?

In November, a third S-DARS provider popped up. WCS Radio Inc. made application to the FCC for authority to construct, launch and operate a system that will compete with CD Radio and XMSR. WCS Radio is not a single entity, but is a collective of several licensees that were awarded licenses through an auction. The collective's name comes from the service band in which it is licensed: Wireless Communication Service. The band was created in 1997.

WCS Radio has two frequency spans, 2.31 to 2.32GHz and 2.345 to 2.36GHz, for a total of 25MHz of spectrum — as much as CD Radio and XMSR combined. (CD Radio and XMSR span 2.32 to 2.345GHz, each occupying 12.5MHz.)

Eighteen licensees hold 128 individual licenses in the frequency range WCS Radio covers. Most of these licensees have joined with WCS Radio.

One interesting note is the amount paid at the auction for this spectrum. CD Radio and XM Satellite paid $83.3 million and $89.9 million for their licenses. All of the WCS licenses combined went for $13.6 million. Totaled, the WCS spectrum cost less than one-tenth of the S-DARS spectrum.

Will it work?

WCS Radio Inc. does not yet have all of the licensees committed to working together across its spectrum, but the company does state in the application that it will work around this as needed. There is also a problem with frequency coordination with Canada. The U.S. and Canada agreed to the usage of the spectrum, which includes reassigning some Canadian users from frequencies within the CD Radio and XM Satellite spectrum to adjacent frequencies, some of which are now in the WCS band.

Another consideration is financial feasibility. The other services have economic plans that depend on subscribers. A third service may not be able to compete.

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COMREX

New rules adopted for unbuilt stations

By Harry Martin

As part of its "streamlining" initiatives, the FCC has substantially revised its rules governing broadcast construction permits as follows:

- Permits will be issued for three years, in lieu of the current two years for full-power television stations and 18 months for other broadcast facilities.
- Restrictions on for-profit sales of unbuilt construction permits have mostly been eliminated.
- Permits will terminate automatically at the end of their three-year terms, with no opportunity for extension.

The new rules, which will become effective in February, apply equally to construction permits for new stations and construction permits for changes in the facilities of existing stations. Having concluded that a three-year construction period provides an adequate and realistic time to construct, the FCC will not afford opportunities for extending construction permits at the end of their three-year terms. Instead, unbuilt construction permits will automatically terminate on their expiration dates without further notification from the FCC. The current practice of providing additional time for construction after a permit has been transferred or modified has been eliminated.

The only form of relief will be the "tolling" (suspension) of the three-year construction period during periods of time when construction is impossible because of an act of God (e.g., hurricane, earthquake) and during the pendency of the following: 1) a petition for reconsideration or application for review of the grant of the permit; 2) an appeal to a court of such an FCC decision; or 3) an appeal to a court relating to a federal, state or local requirement for construction or operation of the station. As a result, the three-year deadline can be suspended during the pendency of a court appeal of a final zoning determination, but not during the pendency of a zoning application before a local body. For the three-year deadline to be suspended, the permittee must notify the FCC of circumstances warranting suspension within 30 days.

The new rules also apply to existing construction permits. Existing permits will be extended to three years from the date of the initial grant if requested by the permittee no later than 60 days prior to the expiration of the permit. In addition, the permittee may notify the FCC of circumstances warranting suspension of the three-year construction period. No additional time will be allowed for construction when the permittee has had at least three years to construct.

Ownership reporting changed

The FCC has decreased the frequency of ownership reports to every two years. In addition, the agency has conformed the ownership report filing dates for commercial and noncommercial stations. The FCC also is requiring that ownership reports for commercial stations identify the gender and race/ethnicity of each individual having an attributable interest in the licensee or permittee. The FCC plans to use this information to assess the need to promote opportunities for businesses owned by women and minorities to participate in the broadcast industry.

Effective in February 1999, both commercial and noncommercial stations will file ownership reports in the following instances: 1) when filing license renewal applications and every two years thereafter; 2) within 30 days of consummation of an approved assignment of license or transfer of control; 3) within 30 days of the grant of the initial construction permit for a new station; and 4) at the time the initial license application for a new station is filed.

Noncommercial stations will no longer be required to file supplemental ownership reports within 30 days of any change in previously reported information. All stations may continue to file certifications of continuing accuracy of previously filed reports in lieu of new ownership reports whenever ownership reports are due. Stations licensed to individuals (sole proprietorships) or partnerships comprised entirely of natural persons remain exempt from filing ownership reports.

Commercial stations will be required to identify the race or ethnicity and gender of each individual having an attributable interest in the licensee or permittee (i.e., officer, director, stockholder, member, partner, trustee, executor, administrator, receiver). Sole proprietorships and partnerships comprised of natural persons, which are exempt from filing ownership reports, are encouraged to voluntarily file gender and race/ethnicity information.

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 ownership reports by February 1, 1999: Arkansas, Louisiana, Mississippi, Kansas, Nebraska, Oklahoma, New Jersey and New York.

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Managing Engineering Consolidation

By Benjamin Brinitzer, CSRE

Your former competitor is now your sister station. What happens next?

With the passage of the Telecommunications Act of 1996, most employees now work for large companies that have multiple facilities in one geographic region. Nontechnical and technical broadcast management alike are facing the task of creating new, combined facilities. Challenges include determining who will remain on staff or join the management team. Long-time rivals or, worse yet, friends who worked for different companies may suddenly occupy the same job with the same job description. What can you do when faced with a high probability that your job will be redefined — or even eliminated? Prepare and excel.

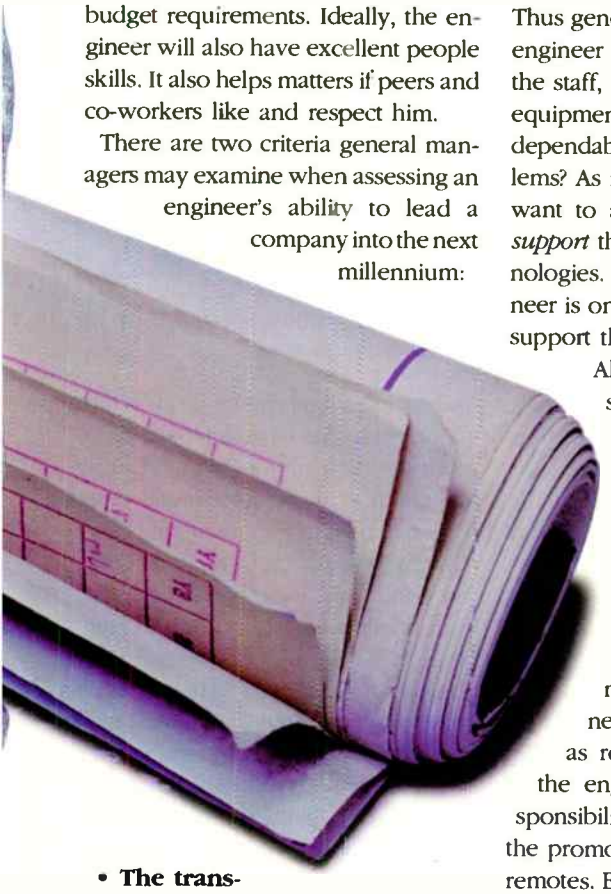
General management

It is often difficult for nontechnical management to agree on proper direction when faced with managing several different staffs or determining the abilities of engineering staffs. After the decision to consolidate is consummated, it is crucial for a general manager or the management staff to decide who will lead the combined engineering department. Experience has shown that you cannot have more than one chief leading a single tribe. To put it another way: How can you have two engineers running the same locomotive? They will both want to take different tracks to get to the same town. This scenario is untenable. The consolidation of the leadership role must be executed before any major projects get underway. Ultimately, making these tough decisions early in the consolidation process will help the company avoid unorganized construction and excessive expenses.

Obviously, the first step in consolidation is planning the new facility and determining how the consolidation will take place. This step naturally falls under the engineer's responsibilities. When choosing a new local director of engineering, good organization skills are an obvious requirement. The engineer will have to be business savvy and, most importantly, have a thorough understanding of broadcast operations. He must understand the engineering department's routines and budget requirements. Ideally, the engineer will also have excellent people skills. It also helps matters if peers and co-workers like and respect him.

The previous owner's capital budget determines how the new sister station studios appear to the untrained eye.

There are two criteria general managers may examine when assessing an engineer's ability to lead a company into the next millennium:



• **The transmitter site.** General managers may check to see that the site is clean and well-organized, and that there's a transmitter-maintenance log that spans the engineer's tenure. Though it is possible to find a very good engineer who is not neat, the individual controlling the engineering department must be well-organized and keep the site neat in appearance. If this is not the case, chances are the engineer is not well-organized in his professional environment. (The transmitter site is a good location to review because it is removed from sight; thus it will be the most likely place to see an engineer's true organizational skills, or lack thereof.)

• **The staff at the new stations.** How do they feel about the engineer? Does he do a good job? Is morale high? (In most cases, the engineer will have had little control over the previous capital budget, and it is that capital budget which determines how those studios appear to the untrained eye. Thus general managers will judge the engineer according to the morale of the staff, rather than the condition of equipment.) Do others view him as dependable? Are there attitude problems? As much as engineers may not want to admit it, they are there to *support* the broadcast staff and technologies. By definition, a good engineer is one who designs systems that support the station.

Almost every engineer has a specialization. It will be up to the engineering manager to determine and schedule his people in such a way that each individual's specialty and abilities are effectively used. Because of the number of studios and transmitter sites and (in most cases) limited personnel, promotional tasks, such as remotes, are removed from the engineering department's responsibility list altogether. Instead, the promotions department staffs the remotes. Engineering is obviously still responsible for proper maintenance of the vehicle fleets and all associated electronics. However, leaving the building to go do a remote for hours at a time is better left to promotions personnel. Of course, this will result in a small labor increase in the promotions department. However, that can be easily addressed with appearance pay. If you feel this is not an option for your company and would rather maintain control of promotional events, a slightly larger engineering staff will be required. The additional staff will most likely be part-time personnel.

Preparing for consolidation

If you have not already done so, take time to examine the quality of your work and the state of your facility. You will soon be working with others in your chosen field on a day-to-day basis. This means you will be dealing with more than one individual working on the same project or task. Since engineers are no longer working alone,

Making tough decisions early in the consolidation process will help the company avoid unorganized construction and excessive expenses.

you may need to learn new ways to interact with those around you. Communication skills are essential to your survival in engineering management.

Document everything you can about your facility. Get as much as possible down on paper or in a computer database so other engineering team members will be able to troubleshoot problems in a custom-built circuit. Communication and organization are the keys to preparing for consolidation. After consolidation, there may be fewer people doing more work. Therefore, you must improve your efficiency and time-management skills. Conversely, you may find that there are several qualified people working together, aspiring to achieve the same position and goals. You will need to keep an open mind about designs and suggestions. As a former mentor once

Engineering Consolidation

told me, "There are many different ways to do a project the right way, but only one way to do it wrong, and that is the wrong way." Listen to those around you, even nontechnical staff

A good understanding of safety and financial issues is an asset in an engineer.

members. Even though their ideas may not match your own, nontechnical staff may provide input that helps you achieve your goal.

In most cases, your company will have a director of engineering. He or she will handle many stations within a region or even within the entire company. Perhaps for the first time, an experienced engineer — one who understands your operating environment and the requirements of your job — will judge your performance and appearance. In the past, it was difficult at best for a general manager to accurately determine your abilities as an engineer. Most general managers had to take their best guess and a gamble. The smart general manager looked for accreditations, certifications, mannerisms and proficiency when judging an engineer. The Society of Broadcast Engineers (SBE) offers the only certification available for a general manager to gauge an individual's abilities (see "SBE certification," p. 32). While the SBE is an excellent way to judge an engineer's technical abilities, it is not a guarantee that the certified individual will blend with the new organization. The adept engineer will develop skills that buttress his SBE credential.

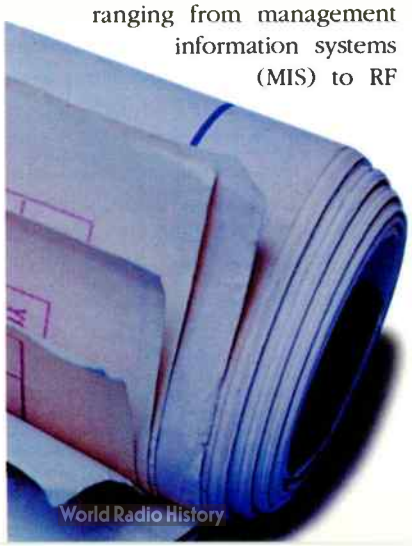
It is in your best interest to run a very tight ship, keeping extensive documentation on the operation of your facility. Start a transmitter-maintenance log for each of your transmitter sites, if one does not already exist. If you do not already have a computerized maintenance database for your studios, build one. Assess your abilities, then overcome your weaknesses and refine your strengths.

From all accounts, the engineer of the future will have multiple abilities, ranging from management information systems (MIS) to RF engineering. The truly valuable engineer will possess a good understanding of business and the financial side of broadcasting as well as the technology that drives the business. Radio is, after all, a business. If you have not already done so, take time to learn new technologies (e.g., hard-disk automation, hard-disk editing, and Microsoft and Novell networking). If all of this seems like too much, or consolidation is imminent, the best you can do is refine your current skills and advertise yourself. If you work all night wiring the new automation and have created a device to facilitate the operation, tell someone. Now is not the time to downplay your contributions.

Operations after consolidation

Once management has determined who will lead the engineering department, operations can begin to return to normal. Great benefits can result from the new combined engineering operation. In most cases, engineering will diverge and specialize, and there will be one director of engineering. An individual may handle just the transmitter sites (i.e., the RF engineers). There will be a new addition to the staff to handle MIS. Perhaps one or two part-time people will handle promotions and vehicles. In most cases it is advisable for the engineering manager to manage the MIS department, since the two have cross-platform responsibilities. However, other methods can be successful. Probably the greatest advantage of the new, larger engineering department will be the way emergency calls are handled.

Transmitter site appearance will help you analyze the work ethic of the engineer.



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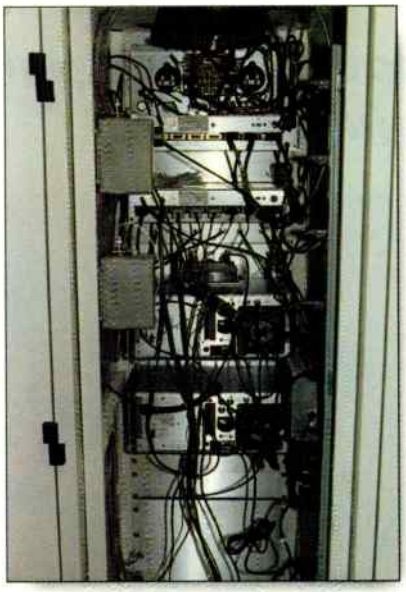
Engineering Consolidation

On-call method

Most consolidated engineering departments now operate emergency services using an *engineering hotline* as a primary contact for all on-call emergencies. The hotline presents a single number and contact for the entire staff to use. In most cases, the hotline is a cellular phone, which is transferred or forwarded to rotating pager numbers on a scheduled basis. With this contact method, no one person is left out of the loop regarding project status. Other crucial information is effectively communicated to everyone. Proper communication will ensure that an engineer will successfully complete his tasks. By rotating on-call status between individuals, it is very difficult for the rest of the staff to develop a favored status with one individual. An added benefit is the obvious matter of rest. When an engineer is not carrying the hotline, he or she is either on secondary or is not on-call at all.



Accurate staffing will determine the physical condition of the broadcast operation.

Finding new talent

The staffing changes made during a consolidation must be carefully managed. Finding new engineering talent is probably the most difficult task managers face today. If you are looking for qualified engineering talent to fill positions within your company, besides taking them from your competitors within a local market, you can try recruiting from local universities and tech schools as well as advertising with the SBE job line and on the World Wide Web. One such service is www.headhunters.net. Trade publications like *BE Radio* are also tremendous assets.

With the consolidation of stations into larger groups, there are not many places to look for qualified help. Let this shortage serve as a call to all professional engineers in this industry to do everything in their power to recruit and train engineers now in preparation for the future. Employers can also help by increasing benefits for engineers (e.g., profit sharing, stock options and other nontraditional bonuses). As we add more technology, replace traditional labor and improve efficiency, we must also add technical staff to support these technologies.

Ben Brinitzer, CSRE, is regional director of engineering for SeaStar Communications Inc., a division of Capstar Broadcasting Inc., Raleigh, NC. Reach him at 919-876-1061 or e-mail benb@interpath.net.

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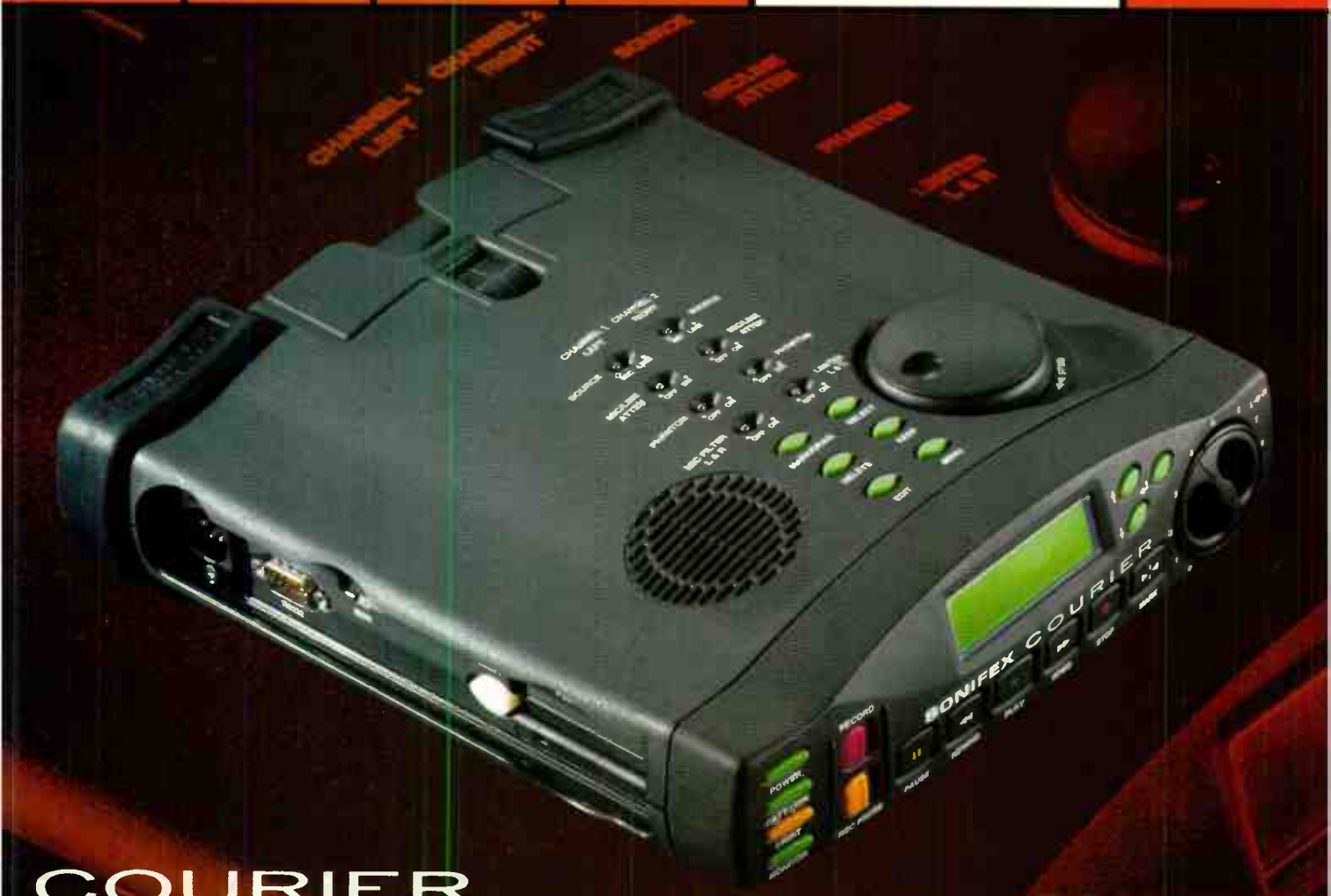

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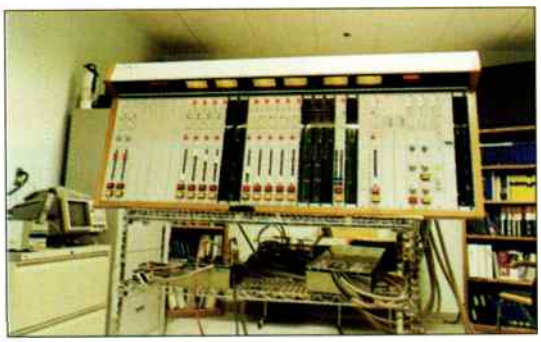
Buying a digital broadcast console

Will your next on-air console be digital? There are several choices to make and options to consider.

By Chip Morgan

We all know the advantages of digital technology — it can make on-air work faster and more flexible. It can reduce the workload of engineers, programmers and radio personalities. And it can give us what we really want: a reliable, technically sound investment.

Engineers have been watching the development of digital consoles for many years, waiting for this technology — which will serve as the heart of the broadcast studio — to be built, tested and proven. The day has finally come when engineers can feel comfortable about specifying and using a digital console in radio broadcasting. Just as news writers made the progression from manual typewriters to electronic word processors, air talent is now making the transition from analog to digital consoles. The shift to digital occurred first in the production room, where editors, with new workstations, taught the value of digital editing. Now there's a need to mix and broadcast the digital audio itself, and on-air consoles are ready.



As with their analog predecessors, digital consoles have already undergone substantial testing and research to make them practical solutions.

The missing link

Manufacturers have been doing their homework. They've designed and built consoles with a careful balance of new systems and familiar features: Air talent needs a familiar work surface to ease the transition, and engineers need simplicity and reliability. The good news is that engineers benefit from a plethora of new interconnection and integration concepts. Some digital broadcast consoles are tightly integrated, with the inputs and outputs right at the console; others separate the console work surface and the I/O connections at a router. Whether you choose an integrated digital mixer or a distribution/routing-type system, both provide advantages.

With traditional analog systems, the space between studios and master control rooms is filled with cables. With digital systems, fiber optic interconnections or digital data cables between rooms can minimize the cable count and eliminate audio ground loops. Compact digital routers can usually handle interconnections for five or more stations. Usually, the only cables that run to the actual board surface are the RS-422 (or other serial connection), monitor, meter, cue and headphone feeds. With a centralized location such as this, you can take advantage of even greater integration. Air talent will appreciate the fact that engineers can remotely access digital consoles, avoiding interruptions in the show. In turn, engineers won't have to deal as often with temperamental talent.

Modification or alignment of digital broadcast consoles will be as easy as upgrading a computer. This is especially valuable in the age of consolidation, with several

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Scott Breakthrough: Free Software!

Thanks to Scott Studios' new ***free*** Voice Trax Via Internet (VTVI) software, announcers can record timely localized shows from anywhere. All they need is a good microphone, mic pre-amp and processor, Internet connection, any Windows® computer with sound card and Scott Studios' ***free*** VTVI!

Simply schedule your station's music. With the touch of a button, your log and latest local copy points are automatically e-mailed to your announcers. And Scott's VTVI works seamlessly with all music schedulers and traffic/billing programs.

Live tags, trivia and copy are displayed automatically on the screen. Announcers don't need a clumsy copy book or liner cards. They can talk as early as they want before songs fade and over intros or in the clear. VTVI is *so* simple to use: a touch of the space bar triggers the next song or the next spot. Voice Trax are recorded with the computer's regular sound card with exceptional digital quality.

Unlike live radio, any or all of the Trax can be reviewed and possibly improved by re-recording. With the VTVI's Segue Editor, announcers can fine-tune their timing of song intros, back sells and donut spots without re-recording.

VTVI is Goof Proof!

VTVI includes Scott Studios' exclusive Voice/Music Synchronizer. Whenever the announcer mentions song title or artist, he or she turns on the link so the back sell or intro plays ***only*** with the correct song.

You Can Even Do Time Checks!

If all the station's spots have been scheduled when the log is e-mailed to the announcer, Scott's VTVI displays accurate time for use in any Voice Trax.

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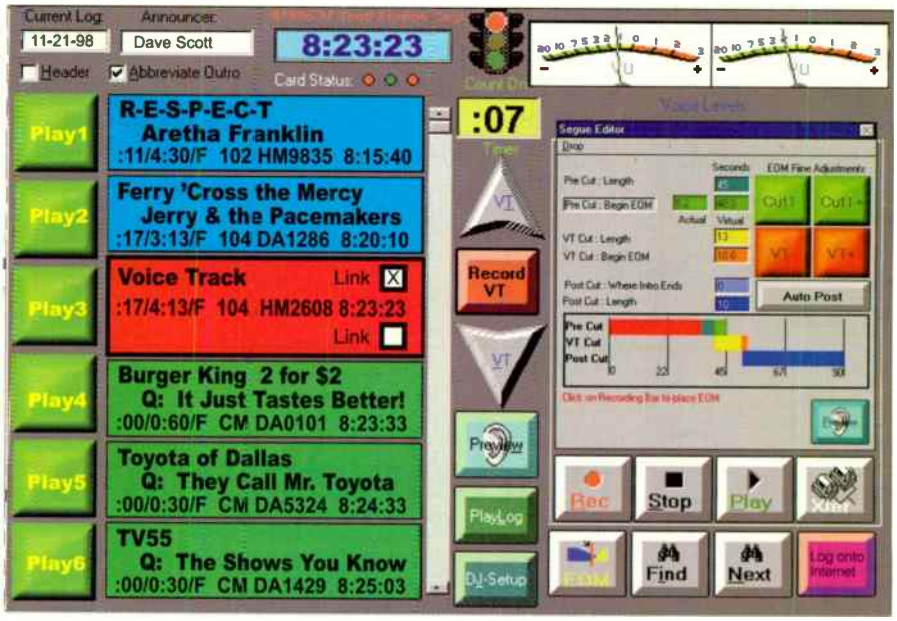
When the announcer is done, a click on the VTVI Auto-Send button dials the Internet over a standard phone line and uploads the entire show to your Scott Studios digital audio system automatically. Transfer does take a long time, but your announcer can be answering e-mail, writing copy or creating promos on the VTVI computer while the show transfers.



Here's Scott Studios' Voice Trax Via Internet (VTVI) software, shown with the optional Segue Editor. VTVI allows a distant announcer to pre-record a 4 hour show in about 15-20 minutes with nothing more than a Windows computer with an ordinary sound card, an Internet connection and a good microphone.

Your station will sound great with Scott VTVI! The only thing you need is an Internet connection on each end, a $29 a month FTP transfer site and the Scott NT System with Remote Recording Router.

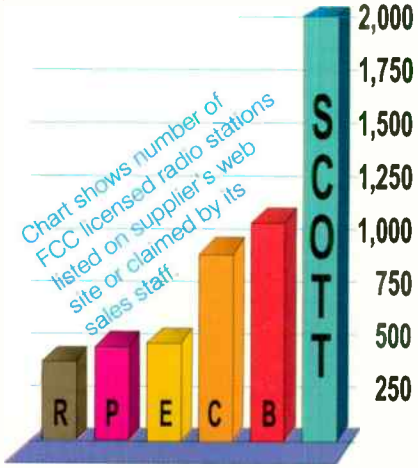
Voice Trax play seamlessly without anyone back at the station. And if the announcer forgets to record something, or if songs or spots get changed at the last minute, Scott's Voice/Music Synchronizer automatically substitutes a generic Voice Trax with the same voice for the day and hour of that break.

3 VTVI Models: Good, Better, Best

Scott Studios also offers a $500 VTVI+ that sends your distant announcer telescoped song intros and endings via the Internet. With VTVI+, a telescoped aircheck can be previewed and fine-tuned in the context of starts and ends of songs and spots.

Or with VTVI Deluxe, your announcers record their Voice Trax ***while listening to song and spot intros and endings*** in context!

VTVI is just one of several ways Scott Studios digital systems can improve your sound ***and*** your bottom line.



It's a fact: More U.S. stations use Scott Studios than ***any*** other major digital audio system. 2,000 radio stations use 4,400 Scott digital workstations, including ***major*** groups like CBS, Chancellor, Disney/ABC, Clear Channel, Emmis, Citadel and many more. Last year, 414 U.S. stations bought new Scott Systems. That's more than chose some other "major" digital systems in many years! Call 800 SCOTT-77 to find out why Scott Studios are chosen the most.

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stations operating under one roof. (For more information on consolidation, see "Engineering Consolidation," p. 28.)

Show control

Digital broadcast consoles offer the advantage of fast and simple console reconfigurations for different show requirements. With analog, what you see is what you get. In the digital world, there is quite a bit beneath the surface. The digital console has far more power than is obvious on the surface. Certain shows work better with a different arrangement of channels, and digital broadcast consoles allow reconfiguration of special settings, either automatically or manually. Some stations simulcast with the same or different commercials and music. Others may have a special scenario for morning drive. At the press of a button, you can change the console's personality, with all of the console channels set up for specific show requirements. You can then quickly switch to a regular music show or go automated overnight.

Since digital broadcast consoles are usually modular, you can begin with a digital console that has both analog and digital capabilities. You don't have to change from analog to digital all at once. Channels can be added or changed as the budget allows or as technology progresses.

Industry attitude

During research for this article, one manufacturer commented that changing consoles is like going to the dentist — you don't want to do it unless you have to.

Many believe that going digital is inevitable and is simply a matter of time. There seems to be a shift among those in the industry from reluctance to readiness. The only question is, should the move be done today or tomorrow?

Currently, only two to three percent of the stations in the U.S. have digital broadcast consoles. One concern is that, being a processor/computer-based device, it can crash. The manufacturers of some of the better consoles address the issue of crashing with redundancy, smart logic and bypass systems. Many studio designers provide analog redundancy in digital facility design to overcome this potential problem. Any critical system should have redundancy.

Cost is a major issue as well. Digital technology is obviously the future, but until now, professional digital consoles have been out of reach of all but the larger radio stations. The cost for a digital console is typically higher than that for an analog counterpart, and the vast improvement in quality may not justify the increased cost.

These days, when building new studios, the true cost of going completely digital is about the same as a

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Digital broadcast consoles

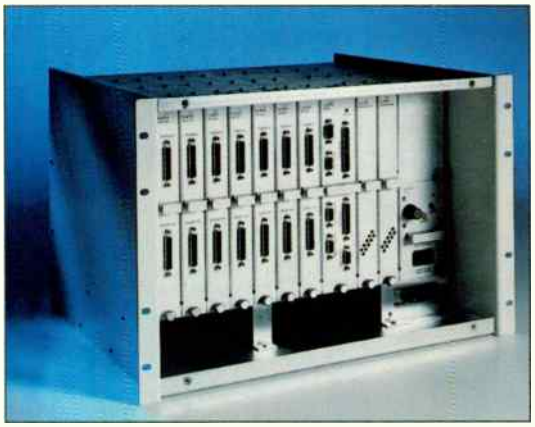
comparable analog system. This is not an accident. Console manufacturers know what the market will bear, and thus design accordingly. The systems are now mature and well-developed, and there's no particular reason to not make the move now.

The proof is in the sound quality. Owners, engineers and program directors love digital broadcast consoles if for no reason other than their purity. These state-of-the-art consoles typically provide a better signal-to-noise ratio than analog consoles of equivalent cost.

Digital broadcast consoles alone won't fix everything. Although considered the heart of the system, digital consoles are only one of many components. Your system will only sound as good as its weakest link. Make sure you're playing the highest-quality audio available, whether music or talk, and that the studio transmitter links are as solid as possible.

Technical aspects

As already pointed out, digital consoles fall into two basic categories: One design uses a stand-alone console with all the connections going into it; other designs rely on an outboard audio engine to handle the I/O and DSP. The console surface acts like a computer keyboard, simply controlling the functions within.



Some console designs use an external audio engine for I/O and DSP functions. Shown here is the Logitek Audio Engine.

Most of the consoles available are capable of sample-rate conversion on the digital inputs, which is helpful since there usually isn't a single, common standard frequency in use.

Summary

Although going from analog to digital can be a little scary, it's a sign of the times. As you design studio systems for the next millennium, keep in mind what impresses listeners — crystal-clear sound. Do your research and don't hesitate to really demo the products. Pay special attention to your programming goals, and look for features and signal flow that will accommodate these needs. Digital broadcast consoles should provide stations with stable performance that remains consistent over time. They should be easily upgradable and reconfigurable as the station grows and technology progresses. Buying a new console can be your chance to grow into new creativity — and new markets.

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MP-3-5	5	3,000W	4.1	$2,270
MP-3-6	6	3,000W	5.2	$2,740

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GP-6	6	6,000W	5.5	$3,700

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SGP-5	5	10,000W	4.1	$5,300
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Digital broadcast consoles

Going on-air

Today, several manufacturers offer digital consoles. Each offers various functions and features, just as with analog consoles.

Following is a list of currently available digital consoles.

Auditronics

NuStar 3001

Four stereo program buses with stereo cue in a modular, familiar layout. Analog/digital I/Os in a separate DSP, rackmounted unit that can be upgraded. Sample rates of 32, 44.1 and 48kHz. The outboard audio engine allows for flexible DSP reconfiguring. Available in 24 or 30 fader frames.

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Fidelipac

MX/D

The eight-channel surface accepts up to 16 stereo inputs and has two stereo and one mono output. 24-bit internal processing. Inputs can be AES-3, SPDIF or analog. Flip-top front allows easy internal access. Graham-Patten Systems is the manufacturer of the internal electronics.

(Fidelipac continued on page 42.)

Not All Digital Systems Are Created Equal.

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Digital Consoles

Fidelipac (cont'd)

BA1230

A 12-channel, low-profile control surface. Accepts up to 16 stereo inputs. Metering/monitor select panel can be mounted on the left or right side. Graham-Patten Systems builds the internal electronics. Input connections are XLR.

215-464-2000; fax 215-464-1234;
gkuchmas@fidelipac.com;
www.fidelipac.com
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Harris

DRC2000

The second generation of this console (the DRC1000 is still available) offers 11 stereo inputs per audio processing unit (APU) with AES-3ID (75Ω) or analog connections. Seven stereo outputs are provided. Each channel has a five-band parametric equalizer and dynamics processing.

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www.broadcast.harris.com
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Klotz

Paradigm

Up to 24 inputs can be controlled and assigned to any of the eight faders on the work surface. The LCD screen displays time and timer information and is used for console setup. Options include a dual fail-safe power supply and profanity delay.

(Klotz continued on page 44.)

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Digital broadcast consoles

Klotz (cont'd)

Vadis D.C.

Vadis is a digital routing switcher that serves as the audio engine for the Vadis D.C. console. Inputs can be analog, AES3, ADAT or MADI format. Fully loaded, the system can handle 1024 inputs and 1024 outputs. Change configurations at the press of a button.

Spherion

Available in 12 and 20 fader-control surfaces, the Spherion is built around the Vadis 3D router technology. DSP is available on any input for EQ and dynamics control. Inputs can be routed to any control fader with full machine-control logic following.

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Logitek

ROC-10, ROC-5

The 10- and five-fader surfaces have a 16 character LCD display per I/O channel and separate on/off buttons. Remote start functions

can be done without turning off the console. Flex configurations, three monitor sections, VU meters. Outboard audio engine allows for flexible DSP reconfiguring, factory support, short learning curve, low price point. Non-modular surface. DB connector I/O.

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Chip Morgan is President of CMBE Inc., Sacramento, CA, a broadcast design and integration firm specializing in high-performance engineering. Reach him at 800-801-2623 or via e-mail at chip@cmbe.com.

Thanks to Logitek, PR&E, Studer and Wheatstone for their assistance in preparing this article.

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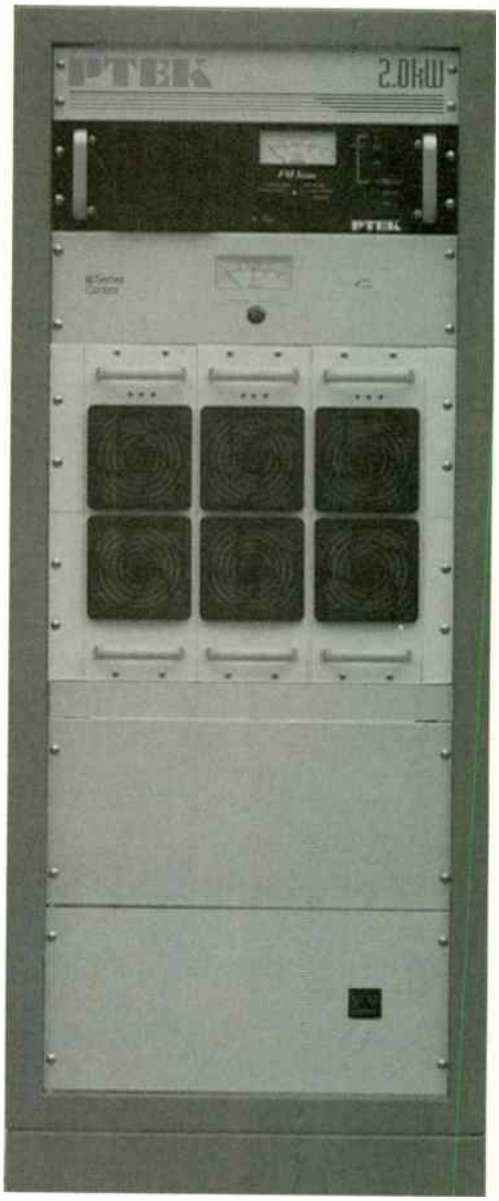

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BROADCAST ANTENNAS

The AM Radiator

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

The antenna is the last link in the broadcast chain.

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

The antenna is the last link in the chain from microphone to listener. It is the broadcaster's last chance to make sure the best possible signal leaves the station. This series of articles will provide guidance for engineers moving into the field of broadcast RF radiation. It will also help engineers maintain full power output and top quality under all conditions, transmit the sound that the studio has produced, and satisfy the FCC inspector — in fact, it is the RF engineer's work with which the FCC is most interested.

The FCC requires every station to have a copy of the *FCC Rules.* Every RF engineer should also be familiar with Part 73 and, if remote control equipment is used, Part 74.

AM antenna fundamentals

The purpose of an antenna is to radiate an RF signal into space without changing its form or character in the process — similar to the audio engineer's aim in the studio (except that original audio will be processed into a sound that pleases the program director).

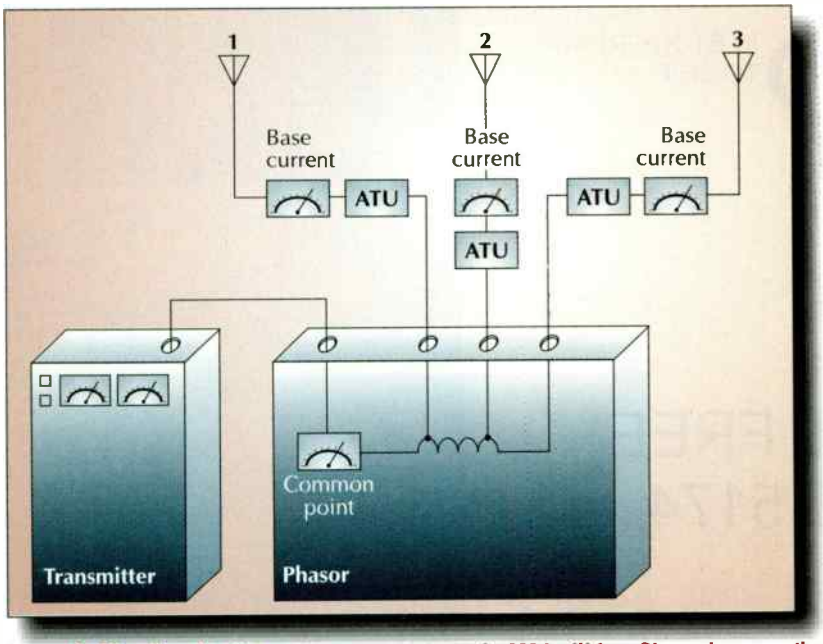

Figure 1. Directional antenna arrays are common in AM facilities. Shown here are the basic phasor system, tuning networks and ammeter circuits.

Today, all broadcast AM antennas in the U.S. are vertical. Experience has shown that vertical propagation produces the best coverage and signal in most receivers, and usually requires less ground space. These towers are massive steel devices anywhere from 12 inches on a face to 36 inches or more and almost any height from 120 to 1000 feet above the ground.

They may be self-supporting or guyed. The guy wires consist of steel cables broken up by insulators to prevent parasitic re-radiation, or pattern distortion, from cable lengths that have a harmonic relationship with the station's frequency. In some cases, when there is possible pattern distortion or interference to a directional antenna, nonmetallic guy wires (e.g., *Phillystran,* a nonconducting resin) are used.

Most antennas are *series fed.* This means that the base of the antenna is insulated from ground by means of a large insulator. This glass base insulator is usually about 4 feet above ground. A 4-inch copper strap should run from its bottom down each of the four concrete base sides to connect to the ground system around the antenna. Antennas that are not series-fed are called *shunt fed.* (Shunt-fed antennas will be discussed in a later installment of this series).

A copper rod or tube, from the *antenna tuning unit* (ATU) to a tower leg, connects the RF drive and the antenna. This drive connection should use at least 1-inch material to provide a good low-loss connection. The RF drive connection must contain one or two turns of a loop to provide a high impedance to lightning strikes. The

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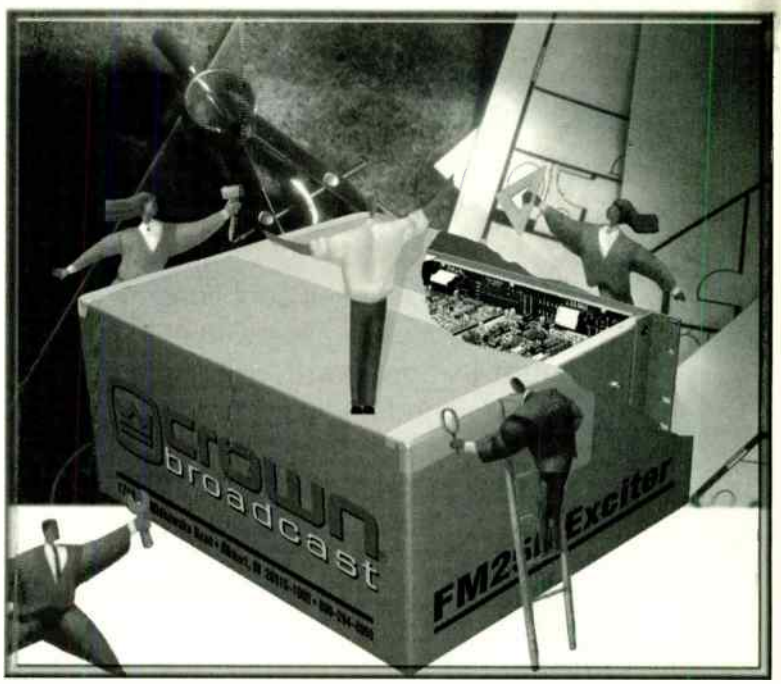

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BROADCAST ANTENNAS

loop should be 18 inches to 2 feet in diameter.

Sometimes this copper connection is split, and each leg receives a drive connection. This split may produce better power distribution in the ironwork. It is common for the electric line for tower lights to be run through the hollow copper antenna connection, which is large enough to carry it comfortably. Such a system eliminates the need for lighting chokes or Austin ring transformers. Lighting chokes are merely RF chokes in series in the power line in the ATU to prevent the electric connection from shorting the RF to ground. The ATU is placed as close to the antenna base as possible, and the fence required by the FCC is placed around it and the antenna.

Usually, antennas less than 199 feet overall height above ground (OAG) do not require lights. Also, the FCC often requires only one tower in a multiple antenna array to be lit. This can save money, and it's worth looking into if you have several towers.

Ground system

The ground system normally consists of 120 #8 copper wires buried about 8 to 12 inches below the surface. Their length depends on the station's frequency, which is also related to the height of the antenna. These ground radials are equal in length to the antenna height above the base. A preferred antenna height is 90º (i.e., one-quarter wavelength). This value makes for easier antenna calculations and provides reasonably good radiation efficiency.

It is good engineering practice to install an expanded copper screen around the base of the tower. The screen is usually 24'x24', though under some circumstances it may be as large as 48'x48'. This screen is made an integral part of the ground connection system and the 120 radials are connected to it.

If you have just joined a station built 15 years ago, you may inherit complaints that the signal is down. After checking station documents,

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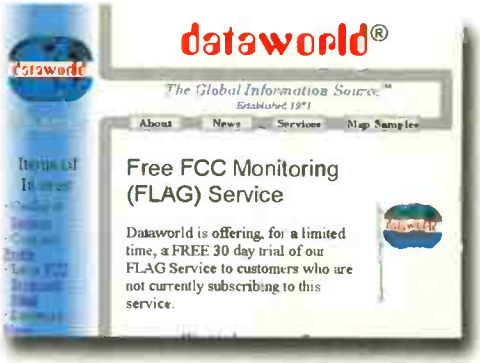

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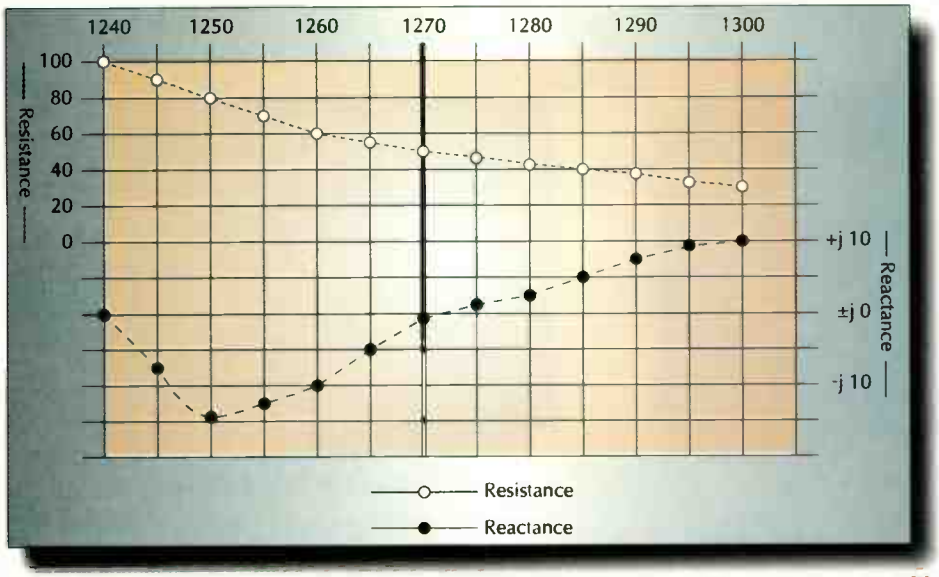


Figure 2. This figure shows a typical antenna base operating impedance chart of the type the FCC requires to be present in every AM station.

especially the antenna operating parameters, inspect the ground system. A deteriorated ground often causes a poor signal. Radials can corrode or be broken by cars driving across muddy antenna fields. It is not even unusual to find that the copper has been stolen. You can make a rough check by taking a pocket radio, reducing transmitter power, and walking out the radials while listening for sudden or poor signals. A better way is with a field strength meter. If you find bad problems with a ground system, the best thing to do — if money allows — is install a new one.

Part 73 of the *FCC Rules* includes two figures that make it easy to determine wavelength, required antenna height and efficiency. Although the FCC basically requires that antennas meet their height specifications, the Commission will also accept differing antenna designs provided they meet the radiation efficiency requirements. It is important to be aware of this because an engineer may join a station and find that, when becoming familiar with the station design and layout records, the antenna does not apparently meet the *Rules*.

Antenna current

A critical quantity in AM RF engineering and broadcast-station operation is the antenna base current. Confusion

items in a station's air chain, such as a compressed digital STL, may also add to this delay.) For this reason, a local program monitor feed is often used instead.

Another option is the ability to control the station's automation system in the live-assist or manual mode from a PC at the remote site. In this case, the talent or operator can run the station's programming from the remote location using a laptop interfaced by modem to the station's LAN. The user interface is identical to that used in the studio, so operations are familiar and comfortable.

A recent trend in radio is the live on-location talk show (particularly of the sports variety) that includes call-ins. In many cases, calls are screened and selected to air at the studio rather than at the remote site. This means that the phone hybrid(s) at the studio must be properly interfaced with the send and receive feeds to/from the remote site, which requires multiple mix minus busing capability on the studio console (see Figure 1).

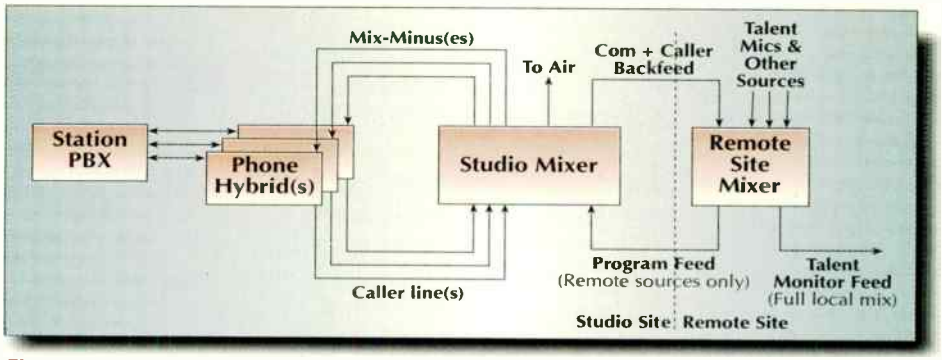


Figure 1. Live call-in remotes often use studio facilities to accept and interface calls, using an arrangement like the one shown above.

Backhaul systems

POTS and ISDN codecs come in a variety of hardware configurations, some of which incorporate small mixing and monitoring facilities. Others are pure codecs requiring external mixers and monitoring equipment. For quick and simple remotes, the integrated variety can allow a "one-box solution," while more complex setups may benefit from the smaller size and flexibility of the codec-only devices. A few systems now offer both ISDN- and POTS-codec capabilities in a single unit.

A number of companies offer POTS codecs, with each codec using a proprietary system. ISDN codecs, on the other hand, use a variety of *standard* algorithms, allowing units from different manufacturers to be employed on either end of a backhaul path, in many cases. To increase this versatility, most ISDN codecs today implement multiple data-compression algorithms, so the

likelihood of compatibility with codecs from other manufacturers is almost always ensured. (The February 1998 issue of *BE Radio* will present a comprehensive rundown of these devices.)

Probably the most commonly used coding algorithm in radio remote backhaul today is ISO/MPEG-1 Audio Layer 3 (also called Layer 3). Layer 3 offers excellent results for mono voice at 128kb/s (using both of the B-channels in an ISDN BRI, via *inverse multiplexing*, also called IMUXing). Layer 3 can be used for voice on a single B-channel (64kb/s), with good results. For optimal results in high-quality stereo backhaul, inverse multiplexing of multiple ISDN-BRIs is recommended. Using two full BRIs (four B-channels, 256kb/s), excellent results can be obtained for full-fidelity stereo using MPEG-1 Audio Layer 2 or Layer 3. Layer 3 can do well in the joint-stereo mode at 192kb/s (three B-channels), leaving the fourth B-channel as a spare or for other utility applications (e.g., communications and computer data). Where multiple BRIs are not available, Layer 3 can be used for stereo audio on two B-channels (128kb/s), also providing fine results.

A new coding algorithm called ISO/MPEG-2 AAC will begin to appear on popular codecs in 1999.

Note that most current ISDN codecs include all the terminal hardware required for connecting directly to an ISDN line (unlike earlier units, which often required external adapters). Nevertheless, many units still require external hardware for inverse multiplexing over multiple BRIs, or they may not support such operation at all. Explore this issue carefully when shopping for a codec, if your requirements include frequent high-quality stereo backhaul via ISDN.

Progress continues in audio codec development, spurred by the need for high-quality audio at the very low bit rates involved in online audio. A new coding algorithm called ISO/MPEG-2 AAC (Advanced Audio Coding) will begin to appear on popular codecs in 1999. This will allow hi-fi mono on a single B-channel (64kb/s) and hi-fi stereo on two B-channels (128 kb/s), thus eliminating the need for ordering, installing and IMUXing of multiple BRIs for most critical stereo applications.

One other area of development involves wireless digital backhaul via unlicensed spread-spectrum devices in the S-band. These units are designed as digital RPUs for relatively short-haul remote pickups with high audio quality.

In future issues, this series as well as other *BE Radio* columns will consider the changing environment of the radio remote in greater detail.

Business/People

Business

Telos Systems demonstrated the world's first commercial MPEG-2 AAC (Advanced Audio Coding) codec at the Tonmeistertagung conference held in November in Germany. The encoder is the first to use AAC, the most advanced audio codec technology endorsed by MPEG. AAC is the joint development of the Fraunhofer Institute IIS, AT&T, Sony and Dolby Laboratories. In recent tests, AAC performed two times better than MPEG-2 Layer 2, and about 30% better than MPEG-2 Layer 3. This means fewer bits may be used in order to achieve a given audio fidelity or that fidelity may be improved at a given bit rate. The encoder is expected to ship in the first quarter of 1999.

▼ **Wheatstone** has settled into its new facility at 600 Industrial Drive, New Bern NC 28562.

Harris has signed a master purchase agreement (MPA) with **Chancellor Media Corporation** to supply radio broadcast equipment and related services to all Chancellor-owned radio stations on a non-exclusive basis.

Harris has also acquired **Intraplex Inc.** Intraplex has become part of Harris' Broadcast Systems Division, but will remain at the facility it recently moved to, located at 59 Porter Road, Littleton MA 01460-1410. Intraplex will now be able to leverage the systems expertise, market leadership, and worldwide distribution and support structures available through Harris. This acquisition expands Harris' ability to offer STL and program-transport solutions for the rapidly changing broadcast industry.

Orban has been joined by **Prophet Systems** in a effort to develop software that will allow finished production to go directly from production workstations, such as Orban's Audicy, to on-air delivery systems, such as Prophet System's Wizard For Windows. Orban engineers have proposed the new software as an extension to the existing Broadcast .WAV File (BWF) standard. The software would allow workstation users to imbed continuity information required by on-air delivery systems in broadcast .WAV files.

CD Radio Inc. has awarded **Globecomm Systems Inc.** a contract valued at approximately $2.9 million by to provide a main origination earth-station facility in New York City. The facility is expected to be operational by December 1999.

CD Radio Inc. has also announced that affiliates of **Apollo Management, L.P** will purchase $135 million of newly issued preferred stock in the company. At CD Radio's option, Apollo will also purchase $65 million of newly issued preferred stock prior to September 30, 1999. The transaction, which is subject to antitrust and CD Radio stockholder approval, is expected to close by the end of December.

XM Satellite Radio Inc. has made agreements with leading radio manufacturers **Alpine Electronics Inc.**, **Pioneer Electronic Corporation** and the **Sharp Corporation** to manufacture and distribute XM-capable radios ands audio systems for the U.S. market. The equipment will enable consumers to receive XM's coast-to-coast, multichannel satellite-delivered digital radio service. **STMicroelectronics** will design, build and market computer chips to process the digital signal for the XM radios.

Telect Inc. recently announced it is formally launching a new division, the Signal Management Group, to focus on marketing the company's comprehensive audio/video product line to the broadcast and entertainment industries (audio/video signal management, or AVSM) as well as the emerging home area network (HAN) market.

People

▼ **John DeSana** has been promoted to group president, HELIAX products, Andrew Corporation.

DeSana

▶ **Alan Haase**, also at Andrew, has been named vice president, terrestrial microwave products.

Haase

Harris has promoted **Cam Eicher** to manager of the Broadcast Center, the U.S. sales and telemarketing hub for the Broadcast Systems Division's line of distributed audio and studio products.

Also in the Broadcast Systems Division of Harris Corporation, **Don Spragg** has been named AM radio product manager. ▶

Spragg

◀ **Ned C. Jackson** has been appointed president and chief executive officer of Telex.

Jackson

The digital transition

By Chriss Scherer, editor

For radio, the transition to digital started several years ago. For many stations, the first digital device was a CD player. Since then, computer-based audio storage and playback systems, DAWs, audio processors and now consoles have made the switch. It is possible to have a completely digital air chain — from mic (post A/D of course) to exciter input.

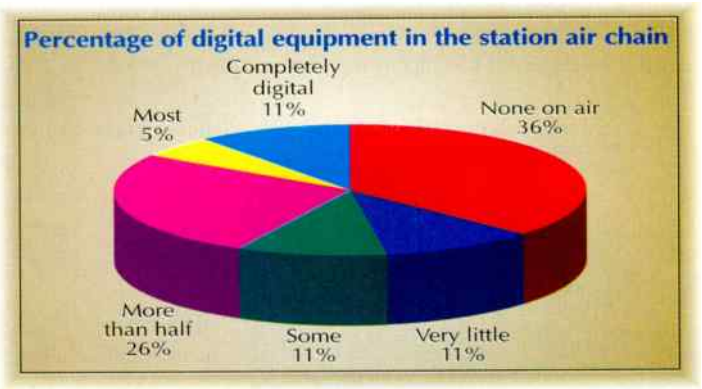
Some stations have made the switch to a completely digital air chain. Other stations have yet to start, except for a few small pieces.

This month's survey looks at how much equipment in the respondents' broadcast chains is digital.

The survey asked respondents to give their answers in percentages. The categories in the pie chart were derived from these percentages. The categories are based on the percentage of the signal path that is digital: very little - 20%, some - 40%, more than half - 60%, most - 80%. Naturally, some rounding was necessary. If only one digital device is in use, respondents answered 0% (none on air).

Survey question ▶

What percentage of equipment in your on-air signal path is fully digital (using digital inputs and outputs)?

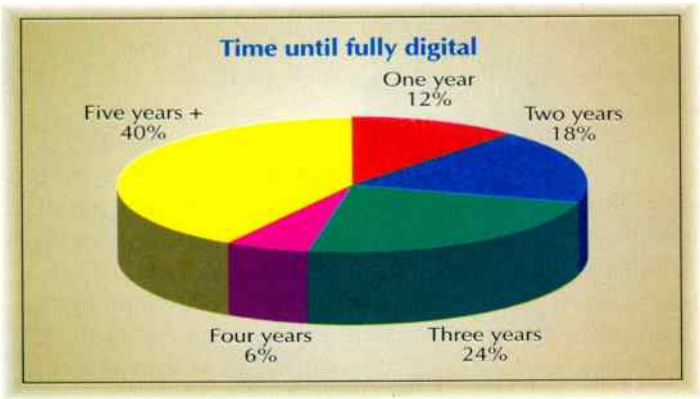


For stations that are not completely digital, making the complete transition is likely part of the plan. In some cases, the transition has been controlled by budget considerations. Replacing perfectly good analog equipment is not logical. For others, a plan is in place and will be completed over time.

A large portion of the respondents (40%) indicated that their stations will make the transition to digital over the next five years. This percentage stands to reason, since almost as many respondents (36%) do not yet have any digital equipment in their air chains.

Survey question ▼

If your signal path is not yet fully digital, what time period is planned to make it such?



Next Survey:

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The next survey results will appear in the March issue.

New Products

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Maycom

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Microwave Filter Company

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Future games

By Skip Pizzi, executive editor

As the millennium begins to wind down, perhaps the most fundamental question broadcasters face is how future audiences use their services. Will the passive, real-time channels of today still rule, or will interactive services such as on-demand streaming and downloads dominate? The answer depends on the hardware consumers will have access to and how they will prefer to use that hardware.

From today's perspective, it seems that the possibilities for tomorrow's audio receivers fall into two categories: the radio appliance and the computer-based platform. But, over time, each of these devices will differ from its current configuration. Radio receivers will likely incorporate the expanded capability of displaying auxiliary data via graphical screens. Some will include new band(s) for DBS radio reception. Meanwhile, computer-based systems will evolve into dedicated, portable browser devices with wired and/or wireless online access. In other words, the two classes of device will begin to appear more like each other.

It's a logical extension to assume that these devices will also integrate each other's features. This means that tomorrow's radio receiver will be a combination broadcast tuner and web media-browser/player, offering access to local broadcast channels, new DBS services, new broadcast data services and wired/wireless online interactive media. Think of this future integrated receiver as a palmtop with a radio, or a boombox with a browser.

When this integration happens, the distinction between platform and appliance, or computer and radio, will be erased. Listeners won't really care about the melding of these technologies; they will use the new devices to effortlessly change between media types at will, just as they move between AM and FM bands on the same radio today. (Remember, AM and FM signals were originally received on separate, and very different, devices.)

A universal process

Other technologies are already undergoing this kind of evolution or convergence. "Smart" home appliances are emerging at a rapid pace, with devices like dishwashers incorporating several multiprocessors. Most of today's automobiles also incorporate microprocessor-based technology. The next generation of televisions and set-top boxes will include more computer-processing power than many of today's desktop PCs.

While the user interface generally defines how we identify a device, the reality is that computers are simply taking on other forms and dedicated applications — instead of the general-purpose model used for desktop computers today. (Certainly, desktop systems will continue to exist, but these too will migrate toward their specific applications — as workstations used primarily for the administrative and creative processes the worker at the desk requires.)

Think of the integrated future receiver as a palmtop with a radio, or a boombox with a browser.

Everyone wins in this scenario: The reliability of the appliance model will be merged with the flexibility and cost-effectiveness of the computer model. Complex appliances will be produced more cheaply and computer platforms will become more robust. In the end, the line between these product types will largely disappear. Again, like AM and FM, old media (broadcast) and new media (online) will be housed in a single box. The distinctions that we see as so profound today will practically evaporate in this integrated environment.

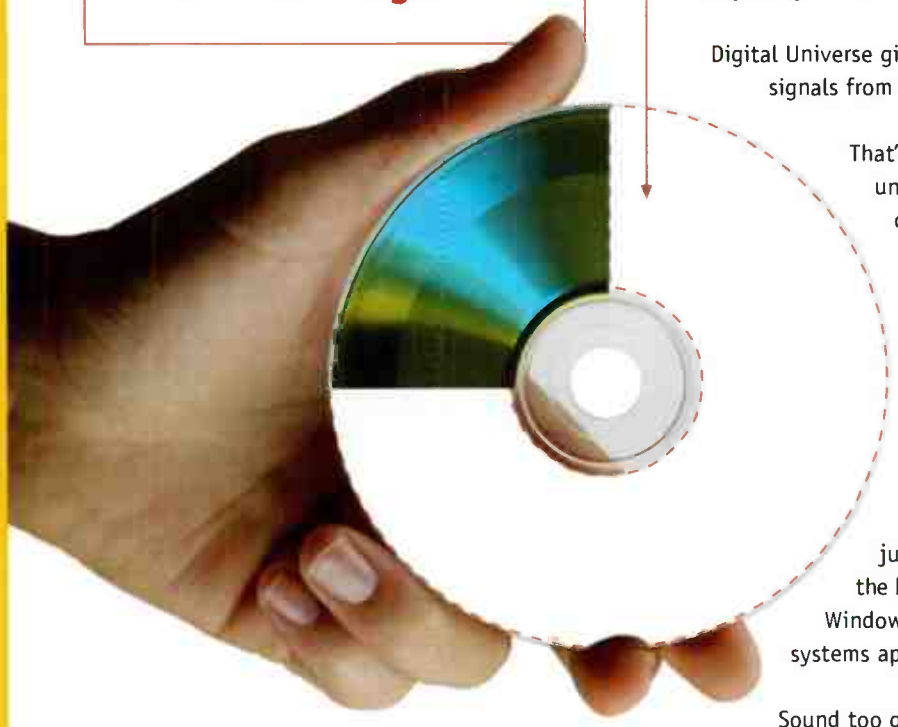
How will broadcasters fare?

In their role as content providers for these new media receivers, broadcasters will have a major transition of their own to manage. The first change will involve the transmission of greater amounts of auxiliary data, some of which will be associated with audio programming.

The other area broadcasters will enter is the world of on-demand programming. While on-air channels will continue to be locked to a real-time clock, the broadcaster of the new millennium will also offer a menu of programs that listeners can sample or assemble whenever and however they desire.

Just as future receivers will blur the boundary between appliances and platforms, future broadcasters will provide a package of real-time and on-demand programming-plus-data as a diverse yet coherently branded multimedia offering. Tomorrow's audiences will expect nothing less.

How much audio does your digital system throw away?



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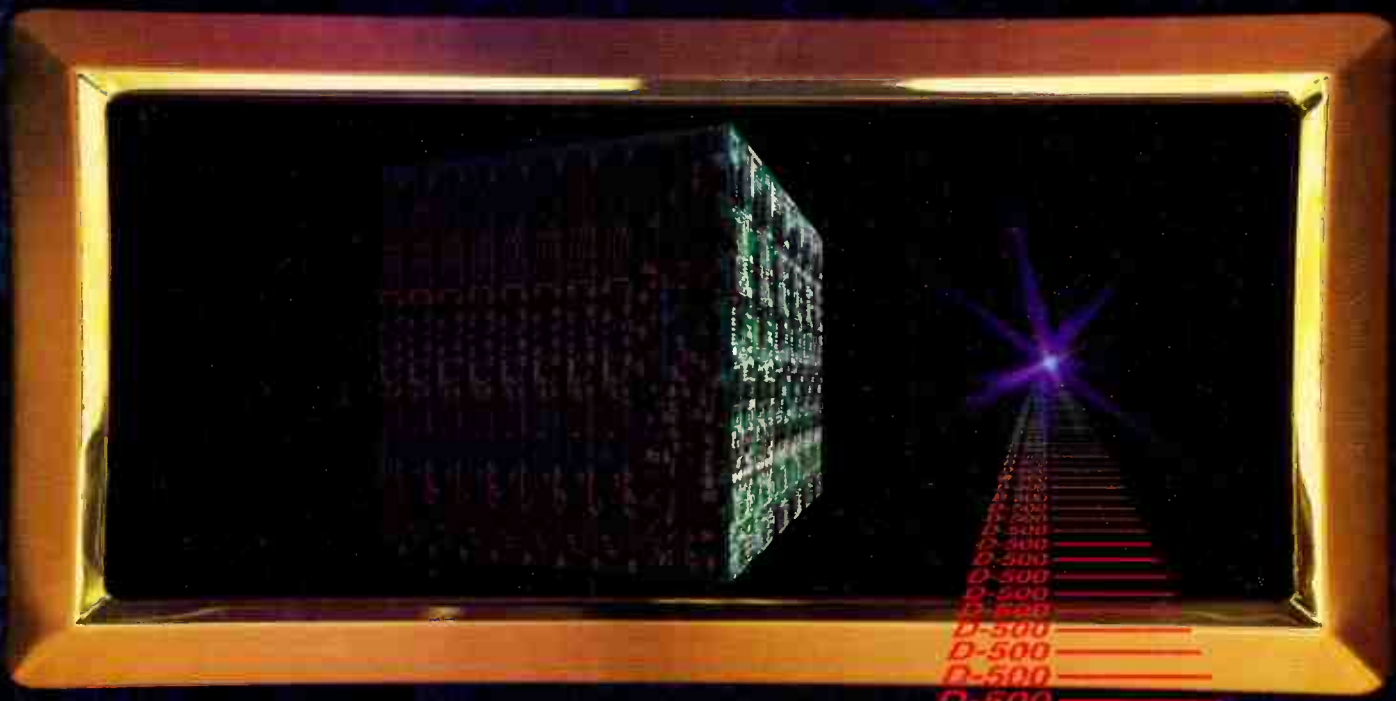

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