May 2000
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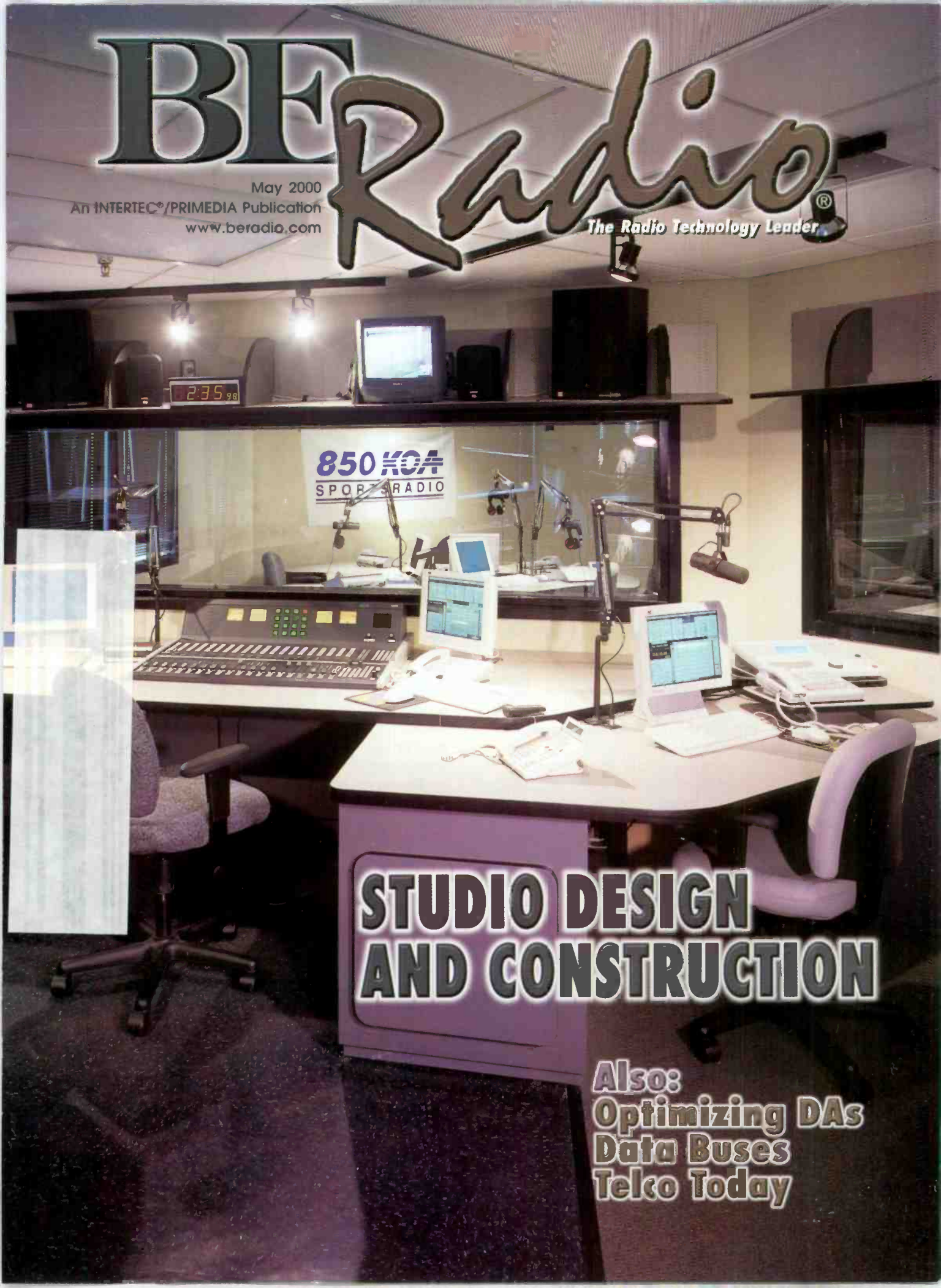

STUDIO DESIGN AND CONSTRUCTION

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Online

ON THE COVER: Studio design projects don't have to be unwelcome projects. The right plans, tools and manpower will make it all work. Photo of KOA-AM by John Robledo courtesy of RDA Systems. Cover design by Michael J. Knust.

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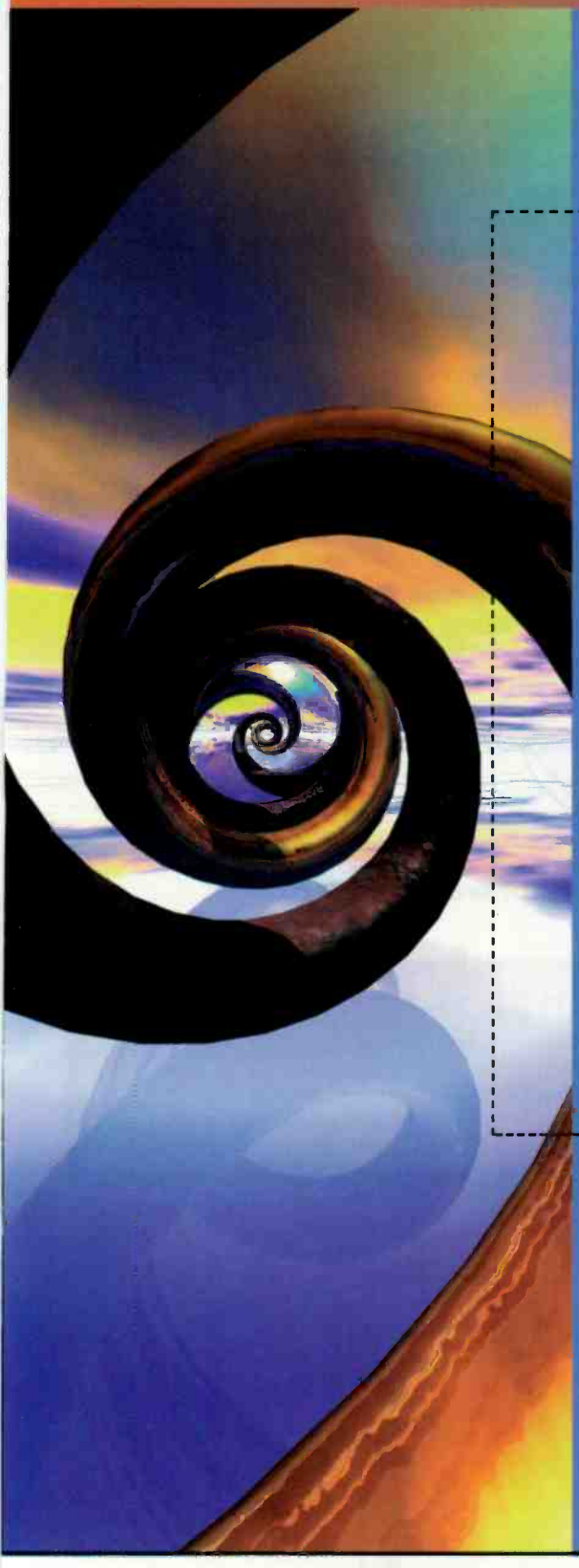

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BE

Leaders Look to BE

A good plan

When you were a child, you undoubtedly were told the story about the boy who cried wolf. The moral of this fable is that no one believes a liar, even when he is telling the truth. I'm not here to teach moral values, but the reasoning behind the lesson is what is important: Sounding the alarm when no danger is present only serves to reduce the importance of the alarm's intended effect. If EAS is used for situations other than true emergencies, it too may need to learn this lesson.

Almost everyone will agree that our current alerting system is much more effective than its predecessor, EBS, and even EBS was more effective than Conelrad. The greatest benefit of EAS is that it can be coded for various types of situations. Participating stations can relay information to the public as quickly as they are received.

A recent instance in Parsons, KS, demonstrated the system's success. In late April, a tornado ripped through this small town in the southeast corner of the state. The town suffered heavy damage from the twister, but there was no loss of life. A few injuries were reported, but none were life-threatening. In this town of more than 12,000 people, everyone survived. Local stations and the Kansas City FCC field office credit EAS as being the key to the town's survival.

The stations licensed to Parsons, KLKC-AM and KLKC-FM, received information from the NWS and their local LP-1 and LP-2 stations. The NWS alerts were immediately relayed.

We have a system in place that can effectively alert the public of immediate danger. Weather-related emergencies are an obvious application for this system. In the case of a tornado, a few seconds can make a significant difference in preventing casualties. Unfortunately, there is no mandate on which situations must be relayed. For Parsons, immediate relay of tornado watches and warnings saved lives.

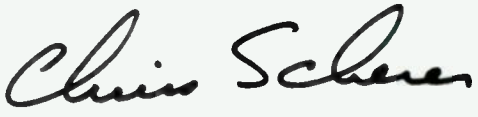
Some local plans focus on local governments and agencies. In most cases, this is a good idea. Unfortunately, people define emergencies differently. One such example is what has become known as *Amber Alerts*, a means for informing the community of a crisis involving a missing child. It was named after a missing child named Amber.

Some communities have discussed activating EAS for these missing-child alerts. An event like a child abduction is important and warrants immediate action, but sounding the alarm to elicit the community's response may not be the best way to alert the people. The problem lies in how these messages are coded. There is not a suitable code for a child abduction. Some government agencies have proposed using civil-emergency codes. This is where crying wolf will get you into trouble.

As it is sounded for more and more events, people's response to the alarm will wane. When you were in elementary school and the fire alarm was triggered, you shot out of your seat and lined up to go outside. I bet that, when the fire alarm goes off in your office now, most people look around to see if it's even worth the trouble of leaving the building.

The EAS is built around state and local plans to determine specific actions. Some plans are better than others. If you do not like how your local EAS works, get involved and change it.

The broadcasters of Parsons are to be commended for their actions in alerting their community of the coming danger, not only in getting the word out, but also in building a solid operational plan that shows that EAS can work and work well.



Chriss Scherer, editor
chriss_scherer@intertec.com

On the road

The American Radio Manufacturers Association (ARMA) will hold its next exposition on June 26 and 27 in Baltimore. *BE Radio* editor Chriss Scherer will moderate the *Future Watch* panel at the show. For more information, go to www.armagroup.com.

Telco today

By Kirk Harnack

We only need to deal with the frustrations of the phone company from time to time, but broadcast equipment must interface with Ma Bell every day. This month, we'll examine some of the equipment we connect to those balanced copper wires.

In general, telco-connected equipment is categorized into one of three groups, depending on its function. Telephone hybrids are used in an on-air or studio setting to converse with phone-in callers and remote guests. Remote mixers and codecs are used to send audio back to a broadcast studio. Fixed codecs are intended for studio-only use. They often feature the highest level of audio quality as well as offering ancillary functions.

Portable, compact mixers like this JK Audio unit are assets at remotes. Some have direct POTS interfaces, like the one shown.

Remote mixers and codecs

Many remote broadcasts and news reports are still linked to the main studio using analog audio over regular telephone lines, or POTS (plain old telephone service). These mixers are usually equipped with one to four audio inputs, headphone outputs, a telephone dial pad and a telephone line connection. Battery operation is typically available. The remote talent's headphones are fed a mix of outgoing audio and return audio from the station for cueing and *interruptible foldback* (IFB).

Several equipment manufacturers have offerings in this field. JK Audio manufactures compact remote mixers; Zercom and Comrex offer larger, tabletop models. The Comrex Buddy mixer offers selectable frequency extension to add more bass response to phone lines when used with a complementary unit at the studio.

Gentner and JK Audio manufacture handset-based audio interfaces. These work by connecting to any existing telephone's handset cord. They are therefore useful when a business phone system prevents direct access to a *central office* (CO) line.

Analog interfaces for cellular phones are also popular. These are cell-phone specific, since they can only be used with the model of cell phone for which they are intended. Such interfaces offer extreme portability while the talent sports a "real" microphone and headsets connected to the cell phone's audio circuitry. This approach is much more professional than talking into a flip phone or handing a cell phone around at a remote.

Audio coding algorithms are making possible the transmission of higher-quality audio over limited-bandwidth connections. AETA, Comrex, Musicam, AEQ, Marti, TieLine and other manufacturers offer remote mixers with interfaces for both POTS and ISDN phone lines. Telos, Comrex and Musicam make ISDN-only remote systems for studio-quality audio from remote locations where ISDN is available. Further, Comrex is developing a portable codec with an upgrade path to allow it to operate with GSM-based wireless phones. Such wireless-based codecs will become commonplace in the years to come, as cellular technology adapts to pass higher data rates.

When using a POTS connection, these mixer/codecs communicate with a codec at the studio using modems not unlike those found in PCs. Audio at the remote site is digitized and coded using the G.722 algorithm. It is then "uploaded" to the studio, where a companion codec deciphers the bit stream back to analog audio. Though decidedly better than analog phone quality, G.722 is considered to be a voice-quality algorithm. It is the most common algorithm used in POTS codecs. Comrex offers an improved, proprietary Vector algorithm that claims improved frequency response compared with G.722 over POTS lines.

With any POTS codec, it is imperative that the data connection be as fast and reliable as possible. If a POTS line is noisy or bandwidth-restricted, a traditional analog phone call may sound as good as, and offer more stable audio than, a POTS-codec connection. A good-quality phone line is imperative to allow the higher, stable connect speeds required for error-free audio. Unlike an Internet connection, POTS codecs don't have time to resend failed data packets; they have to have good data in nearly every packet received.

Codecs offering ISDN connectivity tend to be robust and give users a variety of audio coding algorithms from which to select. ISDN availability is now widespread, although the installation and monthly cost still varies enormously from one locale to another. For remote broadcasts where ISDN is available, the audio quality is superb and connections are dependable.

Almost all ISDN codecs offer G.722 audio coding. Other common algorithms include MPEG Layer II, improved Layer II implementations, MPEG Layer III and APT-X.

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Although most units intended for sports or live remote broadcasts are monaural, the Telos Zephyr Express features stereo line-level mixing and switchable stereo encoding. Some codec configurations use just one of an ISDN line's B channels while others can use, or indeed require, both channels. Properly set up, it is even possible to send high-quality mono audio to two diverse studios.

ISDN telephone systems and hybrids like the Telos 2101 provide improved audio response.

Many broadcasters use MPEG Layer II or Layer III for their high-quality live remote audio. Return audio, cueing and IFB are sent back using G.722 encoding because of its lower coding delay.

Several portable ISDN codecs have rackmounted siblings. Intended for studio or permanent installations, these codecs often incorporate larger displays, more buttons, and more metering and diagnostic functions. Most studio models are stereo, although the coding scheme and ISDN utilization will determine whether stereo or mono audio is sent and received.

Telephone hybrids

The most ubiquitous of telephone devices in broadcasting is the hybrid. Charged with converting two-wire circuits into four-wire circuits (separating send and receive audio), telephone hybrids have evolved from simple multi-wound transformers to DSP-based digital audio processors. The latest digital hybrids can even use ISDN lines for near-perfect operation.

Analog hybrids are still popular, especially where cost is an important factor. They work best when the actual *tip* and *ring* wires from the telephone line are brought into the unit. This requirement makes it difficult to share on-air lines with other office telephone systems. A number of broadcasters are still using 1A2 key telephone systems to act as line selectors for their hybrids.

At least three manufacturers, Gentner, Innovative Devices and Telos, produce hardware designed to conveniently connect and conference phone lines to their hybrids. The Gentner TeleSwitch Call Director can be used with any

hybrid, while the Gentner TS612 and the Telos 1×6 feature hybrids already built in. These units act as miniature phone systems, allowing call management and direction.

For nearly a decade, digital telephone hybrids have brought on-air phone calls to a more useful level of quality and consistency. Upon each call's initial connection, a digital hybrid sends a short noise burst in the caller's direction. The returning audio is quickly analyzed to determine the impedance, phase shift, frequency response and other characteristics of the talk path all the way back to the caller's handset. Digital Signal Processing (DSP) then adjusts several hybrid characteristics to maximize the audio quality.

We don't have to care; we're the phone company.
– Lilly Tomlin

One critical parameter of hybrid performance — analog or digital — is *trans-hybrid loss*. This term describes the amount of attenuation between the send port and the caller port. More trans-hybrid loss is better, as it reduces hollow or distorted audio when the announcer is talking to the caller. DSP-based hybrids can maximize trans-hybrid loss upon initial connection and continually adjust to maintain best performance during the conversation. Digital hybrids can also perform sophisticated processing to improve the intelligibility of the caller and the announcer as heard by the caller.

ISDN

The most recent innovation in getting callers on the air is the ISDN telephone hybrid. Many engineers do not realize that ISDN lines can carry regular telephone conversations and can be dialed — incoming or outgoing — just like POTS lines.

An ISDN hybrid has numerous benefits for obtaining the highest-possible caller quality. Moreover, with ISDN, send and receive audio is inherently separated. No two-wire to four-wire conversion is required at the studio. Thus, trans-hybrid loss is greatly improved and caller and talent volumes can be set higher. ISDN lines also render much faster call setup and completion. And, since the last-mile connection to the studio is all-digital, any noise from an analog connection is eliminated. Currently, Telos is offering ISDN hybrids and call directors.

Time to hang up

As with many technologies, the quality of telephone hybrids is still improving, while the cost of some models is coming down. Stations can afford telephone audio quality today that was either too expensive or unavailable a few years ago.

If you are still placing a microphone over a speakerphone to put callers on-air, perhaps it's time to go ahead and get a hybrid.

Kirk Harnack, BE Radio's consultant on contract engineering, is president of Harnack Enginering, Cleveland, MS.

Broadcast Quality

Date: Wed, 02 Jun 1999 14:50:08
From: Curtis Law
To: Ike Moore
Subject: Telewave FM Dipole

Good afternoon Ike:

Just a little note and a request. Your station survived the winter with flying colors. Joe and I have been able to get to the mountain for the last week and a half, and inspected all the equipment. Your antenna and feedlines are doing fine.

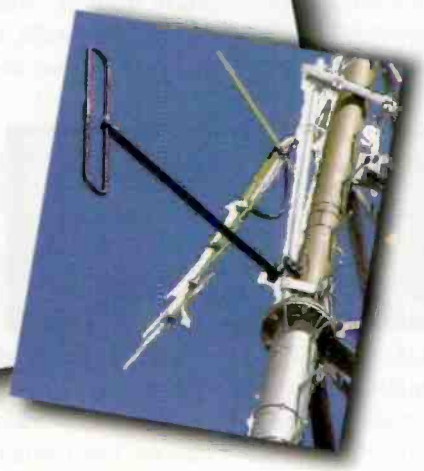
Now for the request. I would like to know your point of contact at Telewave for the dipole antenna you had them make. Let me tell you something: it works in an area where other 100 watt translators can't even be heard. I've personally heard your station with about 2 mountains in the way. Nothing else is heard on FM from that location, other than yours.

Needless to say, Joe and I are impressed and we'd like to talk to Telewave about some antennas for KMXT.

Let me know...

Curt Law
Aksala Electronics, Inc.
Kodiak, Alaska
(907) 486-4700

Attachment: dipole-tower.jpg



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Engineers' evolution

By Chriss Scherer, CSRE, editor

The radio engineer's role is constantly changing. The rampant wave of consolidation that began a few years ago has resulted in some of the most notable changes in our field. As with any profession, radio engineers need to be aware of trends in the industry. Radio itself is growing and evolving, mostly because of influences outside of our industry. These changes affect technical radio staff as well, but they may not necessitate moving to another career.

When I began working on this article, I talked to several radio engineers about the topic. Many gave the same response: Consolidation has affected how stations handle their technical staffs. Typically, station groups expect fewer people to handle a higher workload (i.e., more stations). The pendulum is swinging back from where we were six or eight years ago, when stations moved to contracting their technical support. Now, although they are back to building engineering staffs, the current staffs are smaller than they were before the move toward contract labor began.

Certification & Training Sources

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Coverage of the situation described above is extensive. Presentations at conventions and articles in *BE Radio* have examined the situation at length. The current state of radio broadcast engineering has left smaller staffs with higher workloads. This trend, coupled with low salaries (as compared with other technical fields) has prompted many talented individuals to leave radio for careers in wireless or Internet technologies. This exodus proves the point that workload has become a serious point of contention in our industry.

From my observations, there are more job opportunities than there are engineers right now. A buyer's market benefits the buyer. You don't necessarily need to change careers to move ahead; you may need only to change your career path within your field. For technical staff to stay ahead of the race in the field of radio, they must shift their focus to the latest technologies.

The best way to remain employed and competitive in the workplace is to continue to improve and increase your knowledge and skills. By broadening your professional skills, you not only make yourself more valuable to your employer but to yourself as well.

There are individuals who feel they already have enough knowledge and skill for what they do. Unfortunately, the world does not sit still. As technology and our business evolve, so must the people involved.

Training or certification

Training is a means for gaining knowledge and developing skills. Certification furthers training by providing a benchmark of those skills and providing others with a means for evaluating them. Either avenue offers opportunities to those willing to make the effort. Only you can determine which method is best. Time, economics, personal desire and incentive all are important factors.

Certification programs that relate to technical skills in radio broadcast have existed for some time. The Society of Broadcast Engineers (SBE) and the National Association of Radio and Telecommunications (NARTE) offer certification programs that are recognized throughout the industry.

Recently, more and more engineers have added computer-oriented certification to their credentials. Novell and Microsoft both offer certification on their systems. If you work with a system using one of these company's technologies, manufacturer-specific certification is a plus. This type of certification is not new in radio; many transmitter manufacturers — and now automation system manufacturers — offer some type of training course.

Most certification programs provide an abbreviation to identify the certification holder. As you achieve various types of certification, the entire alphabet can seemingly follow your name. Those who have several levels to their credit may need to choose which set of marks is most applicable to which situation.

One way to see how the nature of radio engineering has changed is to look at a new level of certification the SBE offers. The Certified Broadcast Networking Technologist program is a broad-based certification program that covers the key components of the skill set without focusing on a any manufacturer's product. The program began this year, and the first exams were administered at the NAB 2000 convention.

I have heard some people say that their employers do not support the idea of continuing education or certification. There is a concern that the employee will take the new skills and move on to a better position. If this is the case, you should make the move yourself and find that better position. Your new employer will likely support your decision to enhance your skills or become certified.

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Tweaking the DA

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

There comes a time in every engineer's life when the DA no longer seems to perform as well as it once did. When this happens, several approaches may return it to its original operating condition. These range from a complete new proof, in extreme cases, to a few simple changes or a short set of field-strength measurements.

Spotty reception

Sometimes complaints of poor reception are received in what should be a major lobe. In these cases, look for new tower construction, especially cell or wireless, around the 200-foot mark. Towers that are unapproved by the FCC pop up quite frequently. Run a field-intensity radial or two to check the situation. If nothing shows up and the DA is fairly old, consider the possibility of an undiscovered flaw in the original pattern.

Directional arrays can suffer from changes in coverage due to aging components, local construction and other outside influences.

There have been cases in which an unfound radiation reduction condition has occurred in a DA that was perhaps originally calculated every 10 degrees (perhaps 40 years ago) rather than every 1 degree using today's computer programs. It is possible that an unexpected pattern condition was produced and, because the azimuth did not fall on or near a required measured radial, it was not found until now.

An easy way to check this is to run a transverse radial. On a topographic map, locate the area of poor reception. Lay down and measure a radial that acutely crosses two or more of your required radials about 5 miles from the transmitter. Make measurements every half mile or so. The signal is bound to vary slightly, but it should give you an idea of any signal pull-in in the area.

A simpler way to check is to run a 1-degree pattern calculation on a computer program. Sometimes older DAs show some strange bulges and dips. However, actual measurements will often turn up things that a calculation does not.

Poor audio

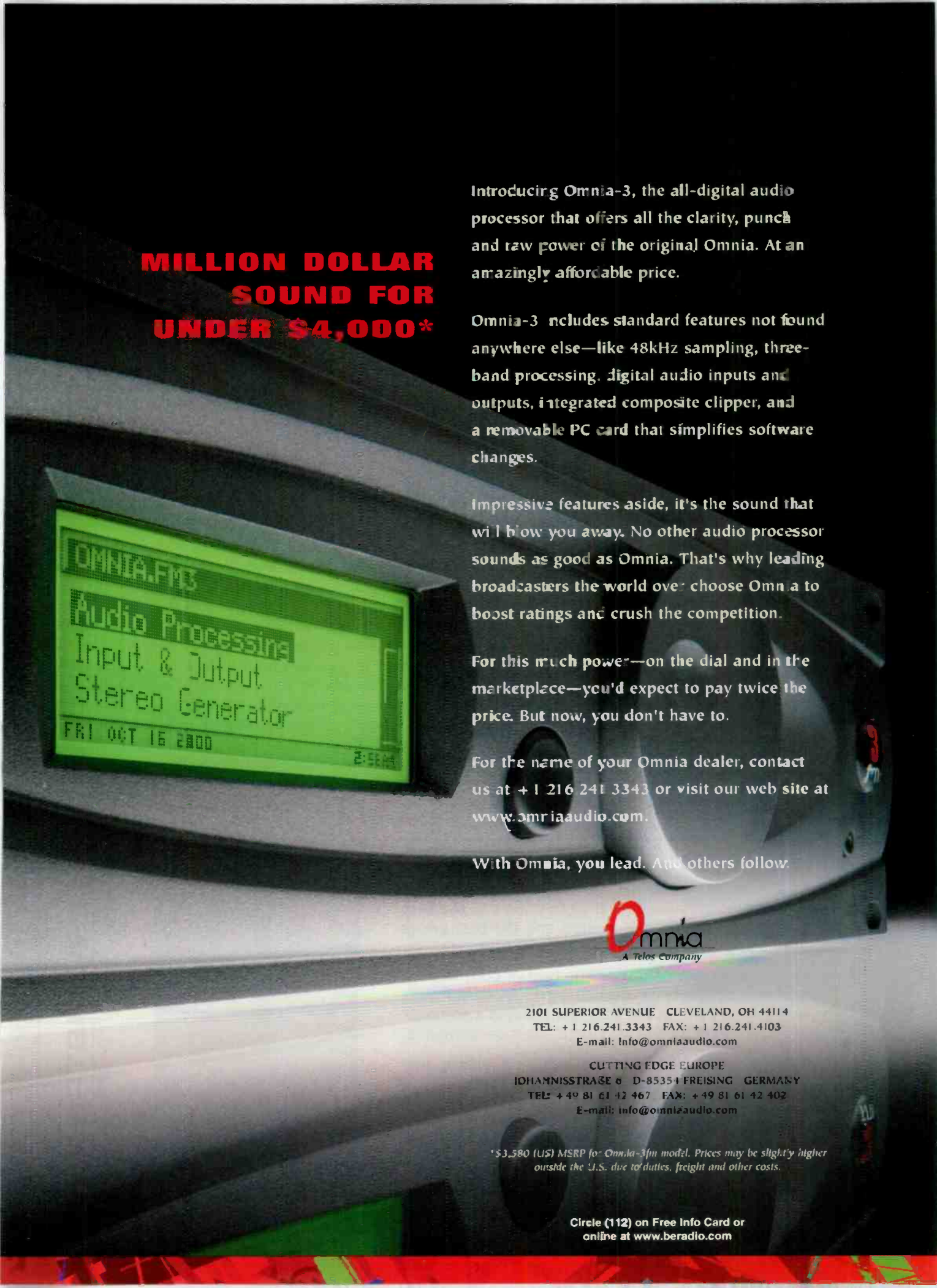
Poor audio quality is more likely to occur in directional stations than in nondirectional ones because, in general, it is much easier to obtain a balanced antenna base operating impedance in the former. Sometimes, too, the DA antenna design lends itself to a high Q condition and narrow bandwidth.

If it is impossible to obtain 100-percent power at high frequencies or excessive modulator current dumps the transmitter, your problem may be at the common point.

Run the transmitter into a good 50Ω, zero-reactance dummy load. A good result strongly points to a need to readjust your common-point impedance. The commission requires a 25kHz spread resistance (R) reactance (X) measurement. This measurement is usually plotted on graph paper, and not too much attention is paid to the slope of the X term when the reactance value is zero and R = 50Ω have been produced.

Many engineers shy away from Smith charts. The Smith chart takes into account both terms in the common-point impedance and displays their relationship in a clearly defined representation of the antenna conditions. A Smith chart showing a small U-shaped impedance plot that stays within the 1.1:1 VSWR range is excellent. As the audio quality begins to deteriorate, the plot often starts to go out of the low VSWR circle. A lopsided pattern is a sign of a poor impedance match, which results in loss of high frequencies and high-end distortion. For a good collection of articles on Smith charts, see http://sss-mag.com/smith.html.

Besides the common point, individual tower-base operating impedances should be checked and plotted in the same



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way. If the base impedances are reasonable but the common point is terrible, consider redesigning your phasor.

Some of the older phasors may require replacement, or at least redesign, of the common-point matching and attention to the power-dividing network to improve their operating conditions and the audio. Redesigning the whole DA using modern computing methods to develop a more efficient antenna pattern and parameters may be worthwhile.

Network design

Most engineers are accustomed to seeing a capacitor and inductor in series in network legs to obtain the desired operating reactance when negative reactance is required. Figure 1 shows a typical TEE network with a capacitor C in series with a tapped coil L. The coil's inductive reactance is used to cancel out enough of C's capacity to produce the desired specific capacitance (negative reactance) for the leg.

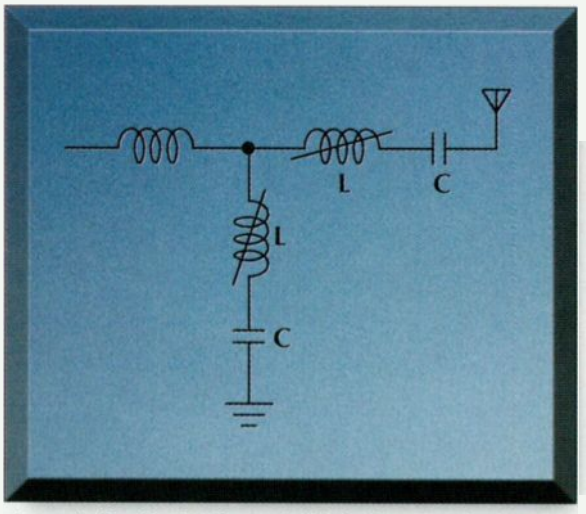

Figure 1. Replacing the variable inductor and capacitor in the shunt leg with a gas-filled capacitor will allow tighter control.

A better way to obtain the precise capacity is to use a variable capacitor. A typical air-spaced variable capacitor would not be suitable for obvious reasons (e.g., voltage breakdown, subject to easy misadjustment, current capacity). A vacuum or gas-filled capacitor that can be adjusted to the exact value required is necessary. These are expensive, but they are especially valuable in patterns with tight nulls. Eliminating the inductance in the leg sometimes produces better audio in particular cases.

The 10kHz test is practical and can be made using your field-strength meter to obtain an approximation of the system's bandwidth. Sometimes this is easier than measuring each tower. It is comparatively simple, but it is best not to perform this test in the daytime. Not only will the listeners object, but the PD will also blow a fuse.

The test is made in two locations. One is in the major lobe; the other in a null (low-signal area). First, take your field-intensity meter to a electrically quiet location within the major lobe around three-quarters of a mile from the array. Modulate the transmitter at 10kHz at 50-percent modulation level. In general, it is best to do this with reduced power. Power level is not too important, but if you are having problems with overmodulation or tripping on high frequencies, be kind to your transmitter and don't work it too hard with sustained high frequencies.

It is best to mount the meter on a tripod or some other secure mounting that will not change as you move the controls. Precisely tune your meter to your frequency and, using the gain control, set 100 percent on the meter. Let it sit for a few moments to be sure it is stable.

Carefully retune the FIM to read your carrier plus 10kHz. Now read the meter. If your upper sideband is correct, you should read 25 on the meter. Tune down carefully to carrier minus 10kHz. If you read 25 on the meter, you have symmetrical sidebands.

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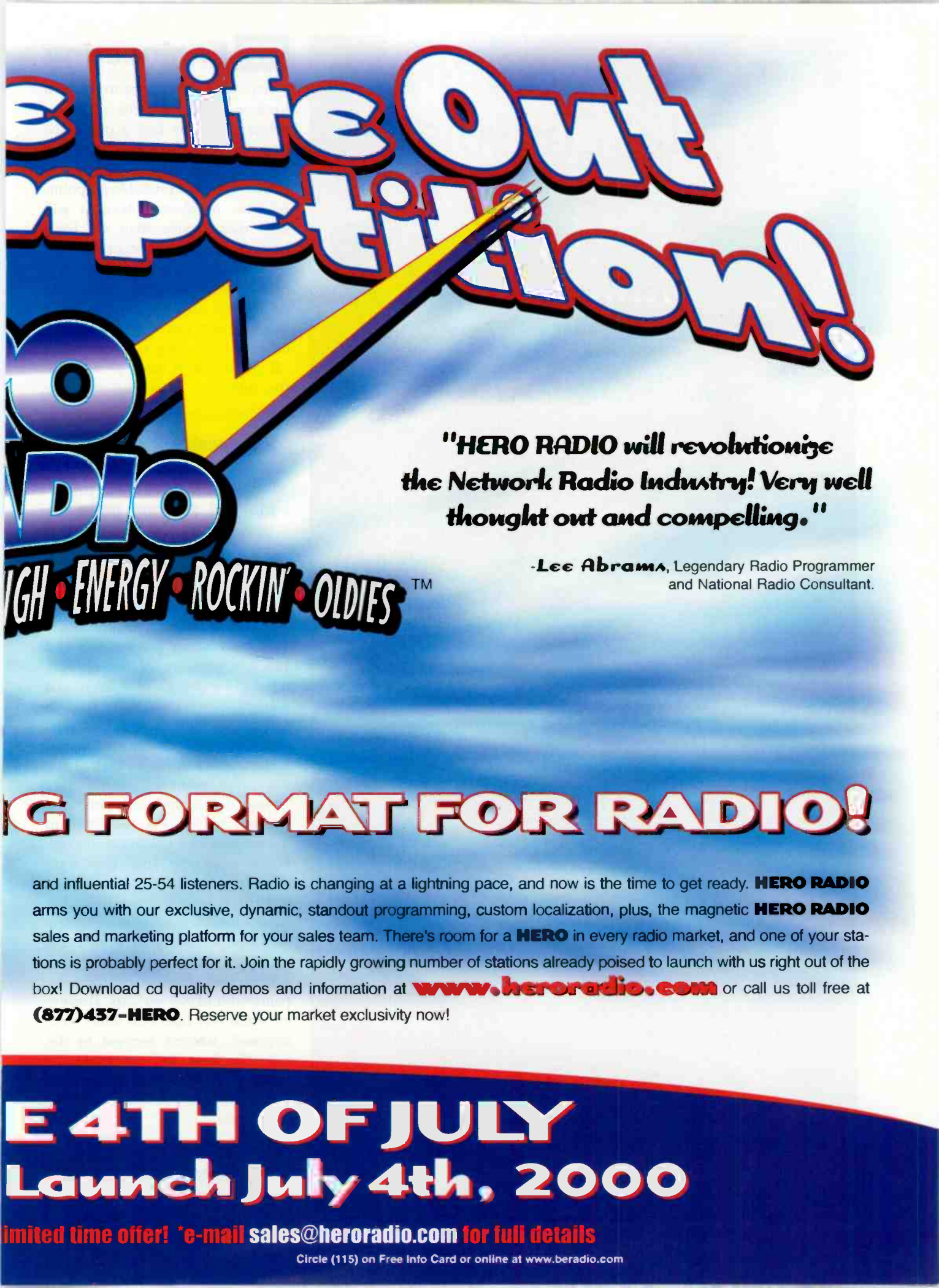
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RF Engineering

Next, take your meter to the null location and repeat the measurements. You may find a difference here. If your sideband measurements differ by more than a few points, you have probably pinpointed your problem. Solving it will take more space than we have here. If you have access to a computerized DA program, you may be able to redefine your operating parameters and impedances fairly easily. If not, you may need to call on your consulting engineer.

If an attempt is made to redesign the antenna, it is important to remember to pay attention to the ratio between the RSS and RMS. This ratio is not precise, but is a valuable measure of the stability (Q) and bandwidth of a directional antenna system. A high ratio is usually an indication of potential instability and the narrow bandwidth that accompanies high Q in a directional antenna.

Redesigning the whole DA using modern computing methods to develop a more efficient antenna pattern and parameters may be worthwhile.

Most of the bandwidth problems encountered in DAs are found in the antenna and transmission lines. For a long time after DAs were developed by the late Glen Gillette in 1930, little attention was paid to bandwidth problems. Prior to the development of the NRSC RF mask about 15 years ago, engineers began to find ways to broaden the bandwidth of AM stations. However, when very tight FCC limits were imposed, interest seemed to die out. The best we can hope for today is a plot that is as flat possible through the carrier and out to ±5kHz.

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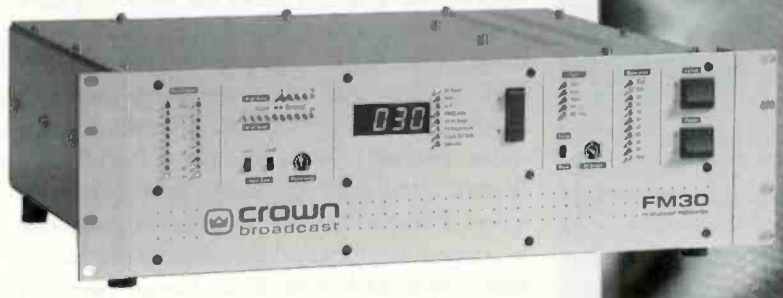

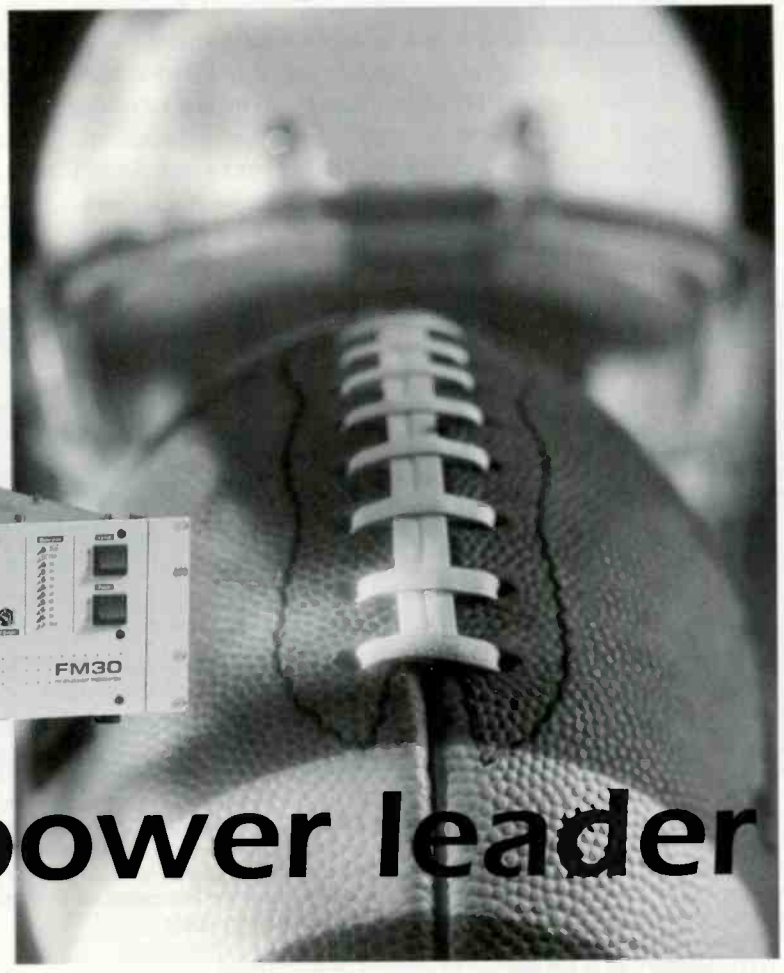

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SCSI vs. EIDE

Kevin McNamara, CNE

In today's multimedia-intense environment, having the fastest processor is only part of the performance story when configuring a PC. An improperly selected hard drive will cause a PC with a high-performance CPU and tons of RAM to work at speeds far below expectations. The hard drive is a mechanical device and is still subject to mechanical limitations. Fortunately, however, technology has advanced to the point where hard-drive performance is becoming less of an issue. The key is knowing what to look for. SCSI drives have long been the leader in terms of raw performance, but an enhanced version of the popular IDE interface, called EIDE, is emerging.

STA Terms	Bus Speed, MB/Sec. Max.	Bus Width, Bits	Max. Bus Lengths, Meters[1]			Max. Device Support
			Single-ended	LVD	HVD	
SCSI-1[2]	5	8	6	note 3	25	8
Fast SCSI[2]	10	8	3	note 3	25	8
Fast Wide SCSI	20	16	3	note 3	25	16
Ultra SCSI[2]	20	8	1.5	note 3	25	8
Ultra SCSI[2]	20	8	3	-	-	4
Wide Ultra SCSI	40	16	-	note 3	25	16
Wide Ultra SCSI	40	16	1.5	-	-	8
Wide Ultra SCSI	40	16	3	-	-	4
Ultra2 SCSI[2,4]	40	8	note 4	12	25	8
Wide Ultra2 SCSI[4]	80	16	note 4	12	25	16
Ultra3 SCSI or Ultra160	160	16	note 4	12	note 5	16
Ultra320	320	16	note 4	12	note 5	16

[1] These bus lengths may be exceeded in point-to-point and engineered applications.
[2] Use of the word "narrow" preceding SCSI, Ultra SCSI, or Ultra2 SCSI is optional.
[3] LVD was not defined in the original SCSI standards for this speed. If all devices on the bus support LVD, then 12-meters operation is possible at this speed. However, if any device on the bus is singled-ended only, then the entire bus switches to single-ended mode and the distances in the single-ended column apply.
[4] Single-ended is not defined for speeds beyond Ultra.
[5] HVD (Differential) is not defined for speeds beyond Ultra2.

SCSI

The Small Computer System Interface (SCSI) has been around since 1980, when the Shugart Corporation developed the *Shugart Associates System Interface* (SASI). The American National Standards Institute (ANSI) adopted the platform in 1984 and subsequently renamed it SCSI. SCSI is not the most widely deployed interface in the computer industry, but it is the most powerful in terms of flexibility and expandability. A single SCSI bus can connect up to seven devices per channel. Currently, two channels are supported, permitting a total of 14 devices to be used. These devices are not limited to fixed disk drives; CD-ROMs, tape drives, scanners, optical drives and even some high-performance printers can attach to the SCSI bus. SCSI is supported and typically used by all current computer-networking platforms.

In the last 10 years, the SCSI standard has undergone significant changes, particularly with regard to throughput. Interfaces can be used that support an 8-bit (narrow) or 16-bit (wide) data bus, the most current version. *Ultra 2 SCSI* will provide data throughput of 20Mb/s on a narrow bus or 40Mb/s on a wide bus as well as supporting up to 16 connected devices. Look for new versions of SCSI that increase data throughput rates to 320Mb/s.

Attaching to a SCSI bus is fairly easy. Every device is connected in a daisy chain. Internal devices use a ribbon cable (or two) that have several connectors attached. One side of the cable is connected to a port on the SCSI controller card, and any (or all) of the remaining connectors attach to a device. External SCSI devices typically use a shielded cable with molded 68-pin high-density connectors (although there are other types). External SCSI devices have two ports, one to connect it to the previous port and one for the next device. Each SCSI device has jumpers or a small switch that permits you to assign a specific bus ID. The ID must be different from others on the particular SCSI channel. If you are configuring your machine for SCSI, it is useful to purchase a controller card with two channels so you can assign one channel for internal devices and one for external.

The last device on the chain of a SCSI bus is always terminated. The terminations will either be switchable or a terminator pack can be inserted in the empty connector.

EIDE

Most PCs on the market are equipped with some form of IDE, or *Intelligent Drive Electronics*, interface integrated into the motherboard. Newer motherboards feature the EIDE, or *Enhanced IDE*, interfaces. IDE and EIDE are a subset of what is known as the ATA, or *AT Attachment standard*. They deal with the disk, controller and interface hardware and software driver requirements. This standard, created in 1994, defined a low-cost method for the 16-bit advanced technology, or AT, PCs to communicate with fixed-disk systems that featured an integrated controller.

PC technology has advanced a great deal since then, as has the ATA specification. The ATA-2 and ATA-3 specifications

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were created in 1995 and 1997 respectively and are called *"Fast ATA"* or EIDE. Among other improvements, EIDE permitted the use of disk drives larger than 504MB and support for up to four devices. (Remember when you needed to partition drives larger than this?) An extension to the ATA specification called ATA-PI (Packet Interface) adds a *packet protocol* to the EIDE specification that allows the use of additional devices, such as CD-ROM and tape drives. ATA-4 (also called ATA/ATAPI-4 or Ultra ATA), adopted in 1998, includes the ATA-PI.

The most current version is called ATA/ATAPI-5; it can deliver data at 66Mb/s, nearly twice that of ATA-4.

In general, EIDE supports up to two devices connected in a daisy chain from a single interface port. Virtually all motherboards in current production feature two EIDE ports that permit the use of four devices. In practice, attaching a second drive to the EIDE interface must be configured one of two ways:

1. Both drives are connected by a *straight through* cable and jumpers on each must be set to designate it as a *master* or *slave*. Typically, the second drive will be called the slave.

2. Both drives are connected by a special cable that determines whether the drive is a master or slave by the position to which it is attached. In this case, a jumper on the drive must be set to a position indicating that you are using this type of cable.

On those machines with two EIDE ports, the ports are named primary and secondary. Each port can handle one master and one slave device. The current ATAPI specification supports up to four ports, although few motherboards provide more than two.

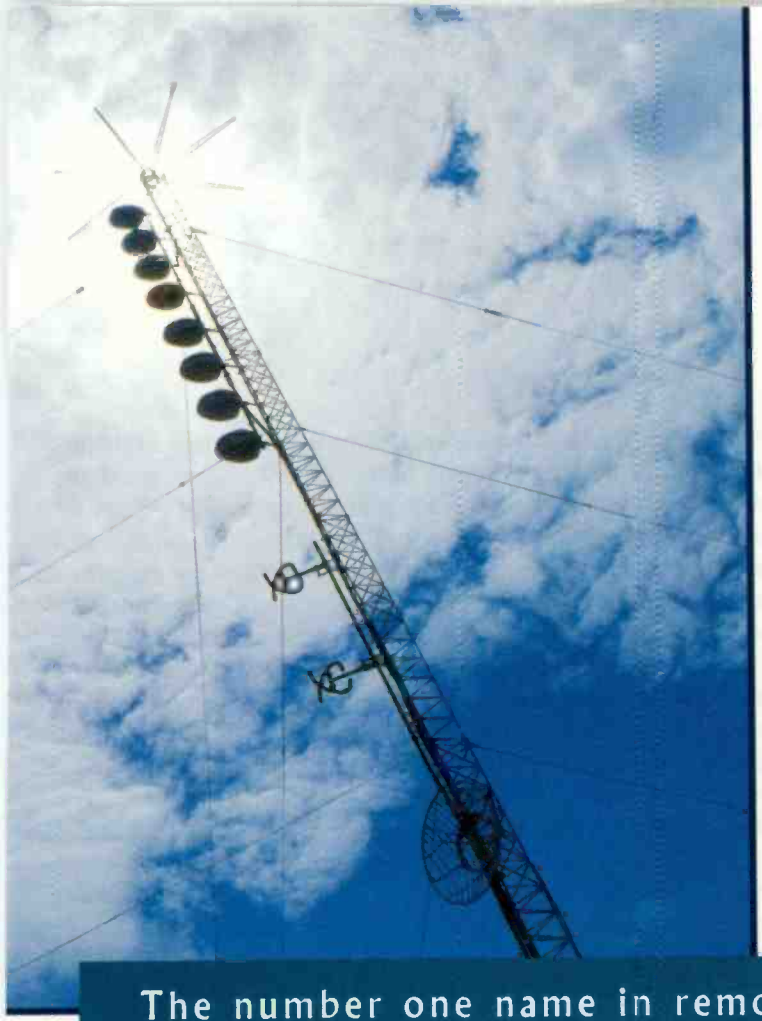
In short

In terms of raw speed, EIDE and SCSI both provide a high level of performance. In fact, a major PC magazine recently did a lab test comparing both types of drives and determined that the EIDE drives in most cases were faster. EIDE drives are relatively inexpensive, widely supported by popular Network Operating Systems and have proved to be a good alternate solution.

Having said that, SCSI remains the popular choice for virtually every mission-critical application. Cost and complexity, once a factor in the decision to purchase SCSI, is less of a factor. The cost of SCSI drives is nearly that of the equivalent EIDE drive. Setting up a SCSI controller is no more difficult than adding a drive in an EIDE system. What SCSI lacks in speed, it more than makes up for in stability, flexibility and performance.

If you are selecting a hardware platform for an application that routinely grows, such as a file server, production workstation or program storage system, using the SCSI bus would make more sense, particularly in systems where it is not unusual to add external drive systems and other peripherals. SCSI supports longer cable runs, up to 6 meters. EIDE does not support external devices and cable runs to only 18 inches.

Kevin McNamara, BE Radio's consultant on computer technology, is president of Applied Wireless, New Market, MD.



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LPFM on fast-track

By Harry Martin

The FCC has announced that it will open a series of five filing windows for 100W low-power FM (LPFM) station applications. This approach is designed to expedite implementation of LPFM service and to promote efficient use of commission resources. With the staggering of filing dates, the commission should not be inundated with an overwhelming number of applications all at once.

To this end, the commission has divided the 50 states, the District of Columbia, Puerto Rico and the remaining territories into five groups, each comprised of 10 states and at least one other jurisdiction. All LPFM applications proposing to locate transmitters in a particular state or jurisdiction must file during the filing window for that state or jurisdiction. Each filing window will be open for five days.

A March 27 lottery determined that the applicants from the following states will be the first to be accepted: Alaska, California, District of Columbia, Georgia, Indiana, Louisiana, Maine, Mariana Islands, Maryland, Oklahoma, Rhode Island and Utah. The window for these states could open as early as May 2000.

Following is the order, also determined by lottery, for processing applicants in the remaining state groups:

2. Connecticut, Illinois, Kansas, Michigan, Minnesota, Mississippi, Nevada, New Hampshire, Puerto Rico, Virginia, Wyoming (Public Notice, July 2000; filing window: August 2000).

3. American Samoa, Colorado, Delaware, Hawaii, Idaho, Missouri, New York, Ohio, South Carolina, South Dakota, Wisconsin (Public Notice, October 2000; filing window: November 2000).

4. Arizona, Florida, Iowa, New Jersey, North Dakota, Oregon, Tennessee, Texas, U.S. Virgin Islands, Vermont, West Virginia (Public Notice, January 2001; filing window: February 2001).

5. Alabama, Arkansas, Guam, Kentucky, Massachusetts, Montana, Nebraska, New Mexico, North Carolina, Pennsylvania, Washington (Public Notice, April 2001; filing window: May 2001).

The dates of the first filing window will be announced by Public Notice at least 30 days prior to the first day of the window. As indicated above, the commission has tentatively determined that filing windows will follow each other at three-month intervals. The Mass Media Bureau may, however, increase or reduce the amount of time between filing windows as it gains experience with the LPFM service and the new filing approach. The dates of the four subsequent filing windows also will be announced by Public Notice at least 30 days prior to the first day of each window.

The commission designed each group to further the equitable distribution of LPFM station licenses in three ways. First, every region of the country is represented in each group. Second, each group is balanced by market size in that each group contains several of the top 15 markets. Finally, with one exception, all of the states in each group are separated geographically, thus reducing the potential for conflicting proposals across state lines. Because of the random selection-method used, each state or jurisdiction had a one-in-five chance of being selected for the first filing window.

The speed with which the first filing group was selected illustrates the high priority that the FCC is placing on LPFM matters. LPFM has long been a pet project of FCC Chairman Bill Kennard, and he seems anxious to carry it through to fruition. In any event, LPFM matters are moving on a fast-track at this time.

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The minimum fee payable under the ASCAP license agreement is $250 per year. There are three different rate schedules, depending in how sophisticated your music-tracking technology is, but the base fee is the same. It is based on the greater of your website revenue or the annual operating expenditures of your site.

SESAC's minimum license fee per website is $50 per six-month period. The rate is calculated by averaging the monthly page requests, multiplying the number by 0.005, and then multiplying that number by 1.3.

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

Dateline

On or before June 1, stations with five or more full-time employees must elect in writing between a rule-specific or alternative EEO recruitment scheme. Annual employment reporting, also reinstated under the new rules, begins again on September 30 with the filing of FCC Form 395-B.

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How to Add Stations

By Robert Reymont, CPBE

Before you draw up plans, make sure you are making the right moves.

The station manager invites you to his office one morning and says, "We just bought two more stations yesterday, and we want to move them in as soon as possible. Prepare a budget and time-schedule right away."

You stare blankly as the manager lays out the details; you have never before carried out a consolidation project. You have no idea what such a project involves or how to get started. You trudge off to your office, mulling over who to use as an architect, how to handle space planning, studio layout and interconnection between studios, and how to connect programming and control to the additional transmitters sites.

You understand that one of the new acquisitions is a news-talk operation, which means added satellite requirements, digital workstations, telephones and required remote facilities. What should you do about UPSs and generators? You already have five or six UPSs running the critical audio processing, remote control, STL and CD players. You are not sure you want to add another dozen or more, with their constant appetite for batteries that seem to fail at the most crucial times. Besides, they consume extra power.

Of course, you must keep the present station on the air while all of this work is completed. To make sure the build goes smoothly, you will need to do the bulk of your work before construction ever begins. The planning process, which is critical to obtaining favorable results, includes finding the right help for the job, allotting enough space for new stations, choosing an architect, attending to the details of the project and reviewing your plans.

Seeking help

One of the first considerations in a consolidation project is where to find the additional help needed to do the wiring and install the consoles and other rack equipment. After all, you are already working 45 hours a week, and it would be nearly impossible to move these new stations into the facility without some help.

to Your Facility

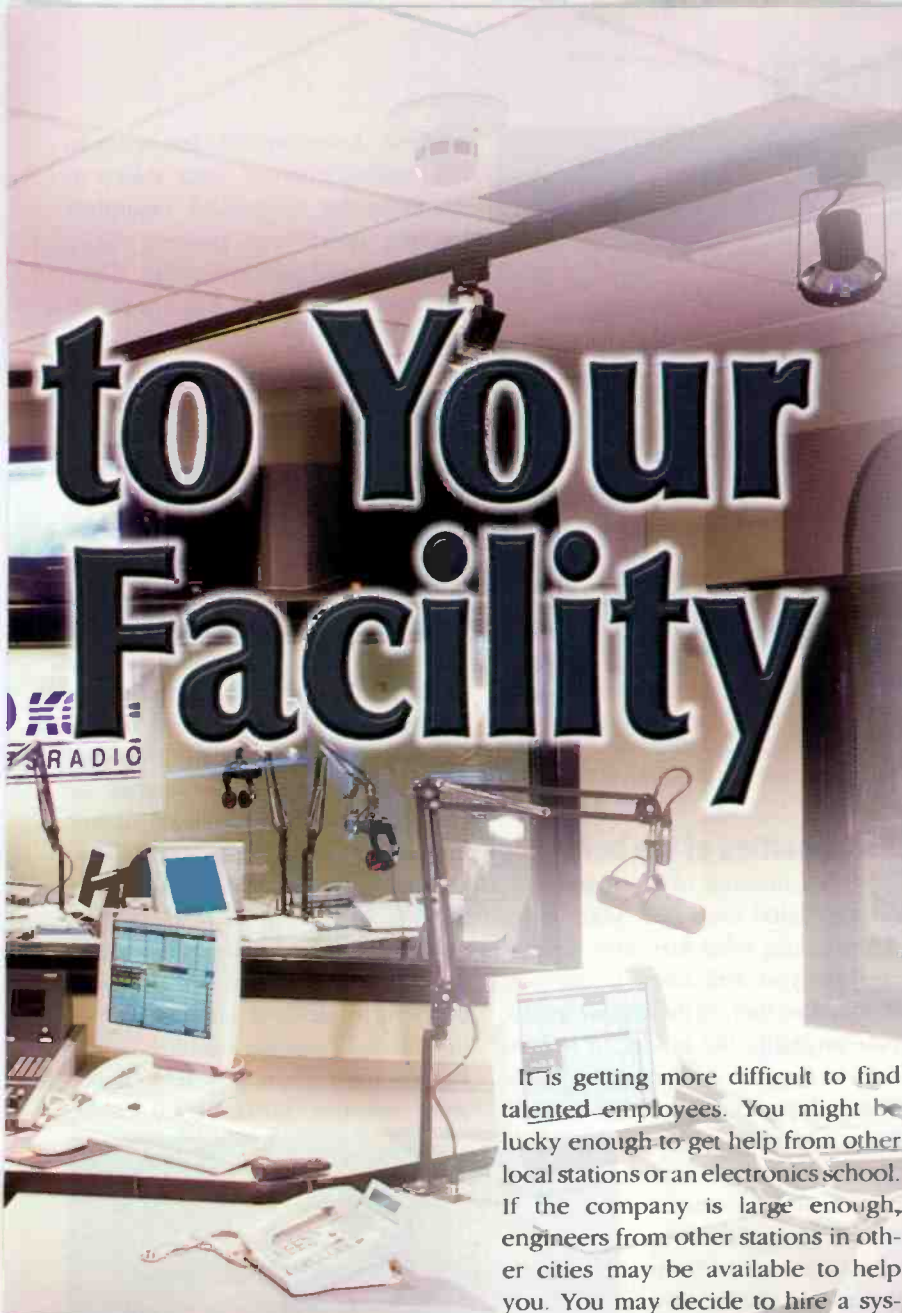

Photo by John Rob edo and courtesy of RDA Systems.

It is getting more difficult to find talented employees. You might be lucky enough to get help from other local stations or an electronics school. If the company is large enough, engineers from other stations in other cities may be available to help you. You may decide to hire a system integrator to do the work. Before you hire such a firm, determine the cost and the extent to which it will be used. Whatever route you choose, secure enough help to get the project done. Make sure you include transportation and other expenses in the budget for engineers you bring from other markets.

Making space

Before you move to the next step in the plan, consider the space requirements of the new stations. If you are blessed with extra space in your facility, layouts may be less difficult than trying to fit everything into a shoebox. As a rule of thumb, an FM or AM single facility should require a minimum of 8,000 sq. ft., and each additional station will need 7,000 sq. ft. to 8,000 sq. ft. Less room will be required for consolidated accounting, sales and promotion departments.

When stations are consolidated, often the biggest problem is personnel. None of the station egos wants to give anything up. Each wants an office for everyone, at least two or three production studios, a newsroom, a break room, a copy room and a mail room as large as the nearby post office. Obviously, not all of these requests for space can be met. Your best ally is the market general manager, who may have to play dictator, or at least mediator, in resolving how space will be allotted.

In a recent consolidation, I moved three stations into a facility initially designed for a single, stand-alone FM station. Fortunately, the previous owner had leased an entire, nearly 12,000 sq.-ft. floor. This made the project tolerable. The early plan added two additional studios as control rooms for the new stations; these studios were never built.

Selecting an architect

Once you have determined your general space requirements, you should select an architectural firm. Make sure the firm is familiar with radio-station or recording-studio construction. When selecting a firm, ask about its experience with soundproof studios. Ask about double windows, special studio doors, wall construction, routing of HVAC ducts and conduits, sound attenuation and sound reflections. If the firm gives any answers with which you are uncomfortable, ask a sound consultant for input. Get proposals from more than one firm before making a selection. Often, if you use an out-of-town company, a local engineer may be needed to sign the plans before building permits can be issued.

How to Add Stations

Central UPSs can be located in the rack room. In this installation, they are to the left of the racks. Photo by Richard Gerlovich.

Once it is chosen, the firm should set up focus groups with all involved parties to determine their individual needs. These parties should include the manager, sales managers, program directors, engineers and others with ideas on layout and work flow. Consider having the firm include a focus-group meeting on company objectives as well.

At this point in the process, the station and the firm should discuss ways to keep costs down. Studios should be located in such a way that they use common walls, fan coils, electrical, 24-hour HVAC and other items specific to studios. Other work areas should be laid out to make for an efficient office. For example, a prize closet could be located near the lobby so receptionists can easily give contest winners their prizes.

While this process is underway, you should check on availability of STL line of site, T1s, permit requirements for satellite dishes and phone-line availability for the added stations. It may be necessary to purchase a new office phone system, house music and a paging systems. Shop for your service provider. Several are usually available; you should ask each about services it provides.

The specifics of the build

With a number of companies offering digital consoles, your work determining what size and type of console you will need is cut out. Remember that, in the digital world, you probably do not need a console as large as in the analog days. These days, music and spots come from a digital audio-playback system and require fewer console inputs. Most of the other signals come from the router. Make sure you provide enough inputs on the console for some expansion. Pick the most console you can afford for your market. Making the right decision now can save hours of work and updating later.

Place all your computers for music, the office LAN servers, music servers and routers in engineering. Remote each computer on a CAT-5 cable using a peripheral extender to each studio. Position only the monitor, keyboard and mouse in the studio. Doing so will cut down on CPU fan noise in the studio, improve your ability to maintain the computers, centralize cooling needs and prevent sticky fingers from resetting the CPU. Sometimes, however, it is not possible to put every digital workstation in the central area.

It might not be a bad idea to add a sync generator to your list of equipment. More and more equipment is now becoming available with an external sync connection. Delays from A/D and D/A conversion can be minimized if everything is timed with the same source. Along with the usual analog and control pairs to each studio, provide at least five CAT-5 cables, four or five RG-58, RG-59, RG-214 cables for TV monitors, front-door TV cameras or weather radar. There usually is not enough RF cable to a control room. On audio and control cables, put in at least 50-percent more pairs than you initially plan to use. Make use of existing wiring if it is still in place, properly terminated and can be documented. If you are running digital signals more than few feet, make sure you use 110Ω digital cable.

Installing all the computer audio servers in one room makes maintenance easier. It also removes a noise source from the studios. In this installation, the office LAN servers are at the bottom of the first rack. Photo by Richard Gerlovich.

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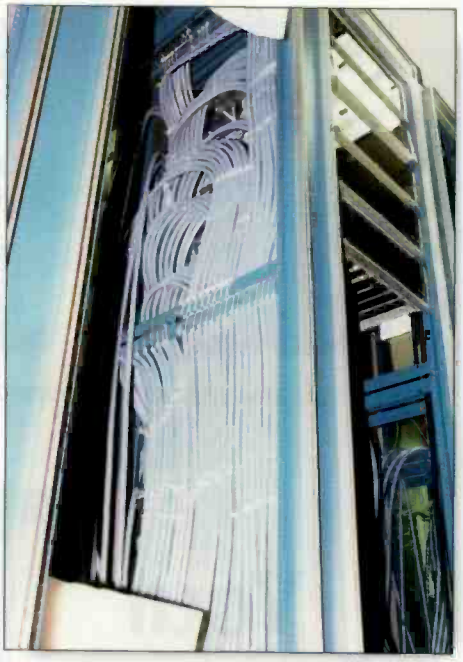
These cables are offered in multipair configurations for connections between studios. For wiring within each studio, use commonly available stereo, shielded, twisted-pair cable as a minimum specification.

At some time, you may need to design a facility in which all connections between studios use fiber optic links. This technology is getting much easier to use. Although the cost of the multiplexers is higher than with traditional cable, eliminating conduit runs saves money, and fiber equipment is extremely reliable.

Time must be spent making sure grounding in each studio is appropriate and complete. I have developed a grounding process that works well. It uses a 4-inch copper central strap in engineering that ties directly to the building ground. In a multistory building, this is usually found in the basement. If possible, run a 2-inch copper strap to this ground pipe and braze it. In single story buildings, drive two 8-foot ground rods and braze to them. At co-located transmitter sites, use the established station ground. In engineering, run a 2-inch copper strap from this ground to each equipment rack, to each grounding kit for RF lines from the roof, and any other metal cabinet in the room. From engineering, run a 2-inch strap into each studio. Before walls are built, I have run the strap in the ceiling. At one station, I put it under the carpet, glued to the floor. Terminate the strap on the console's ground terminal. You may use a tinned ¾-inch braid for the final connection to the console.



Multiple DAs result in a substantial amount of cabling, as shown in this installation. All the DA connections were connected to punch blocks through multipair cables. All of this was removed for the routing switcher installation. Photo by Robert Reymont.

Analog audio ground connections should be terminated to the equipment inputs and left floating at the equipment output. The ground connection should be carried through all punch blocks and patch bays. This procedure eliminates any possibility of a ground loop. In one installation, we even brazed the metal studs in the studio walls to the ground system. Using this technique and foil-backed insulation, we were able to attenuate stray RF by more than 50dB, from 550kHz

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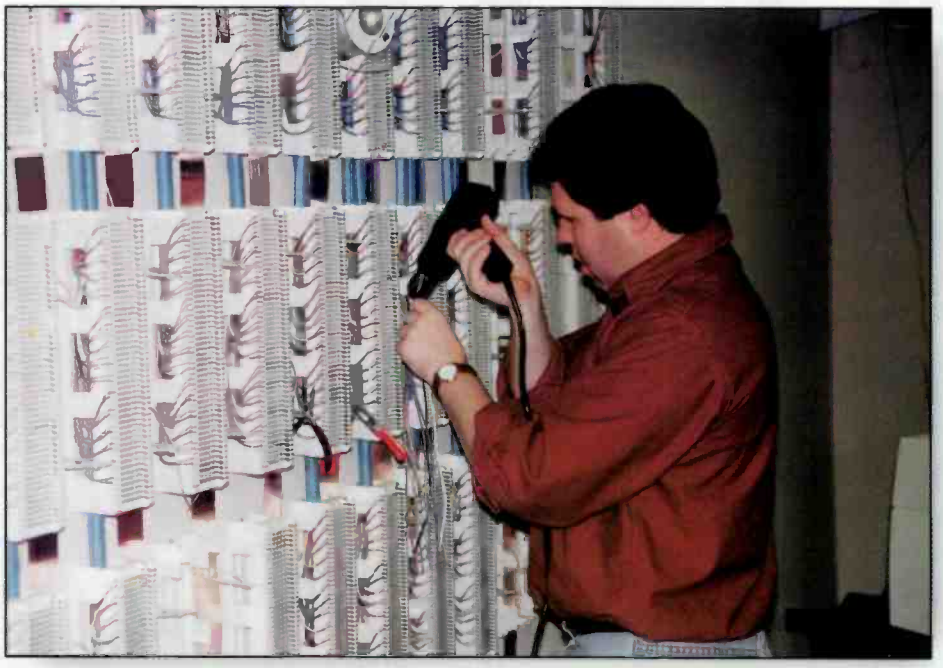
to nearly 100MHz. The studio was three stories above Main Street, and high-powered CBs would occasionally interrupt the program before these steps were incorporated.

Reviewing the plans

When the initial plans come back from the architect, carefully look them over. You can correct many problems at this stage with little or no cost. If you do not address them at this stage, problems can cost thousands of dollars later in the construction phases. For example, one TV station failed to check its plans carefully, and the main studio sounded like a wind tunnel. To this day, it cannot be used as a studio, even though the room was built exactly to blueprint specifications. If you cannot read blueprints, especially the electrical and HVAC sections, hire someone who can. It is money well spent.



Color-coded wire simplifies installation. Notice the copper strap behind the blocks used to terminate overall cable shields. Individual pair shields are carried through the blocks. Photo by Robert Reymont.

Here are a couple of suggestions. Add a 10kV to 25kV UPS to the facility. Provide a circuit from it to each studio and to engineering to handle computers, routers, T1 equipment and processing. Buy the bypass panel to allow UPS servicing without downing the studios.

If you are using bridging or splitting pads, or DAs to feed audio to the existing studios, switch to a routing switcher that can be configured to digital or analog mode. These units are versatile enough to provide

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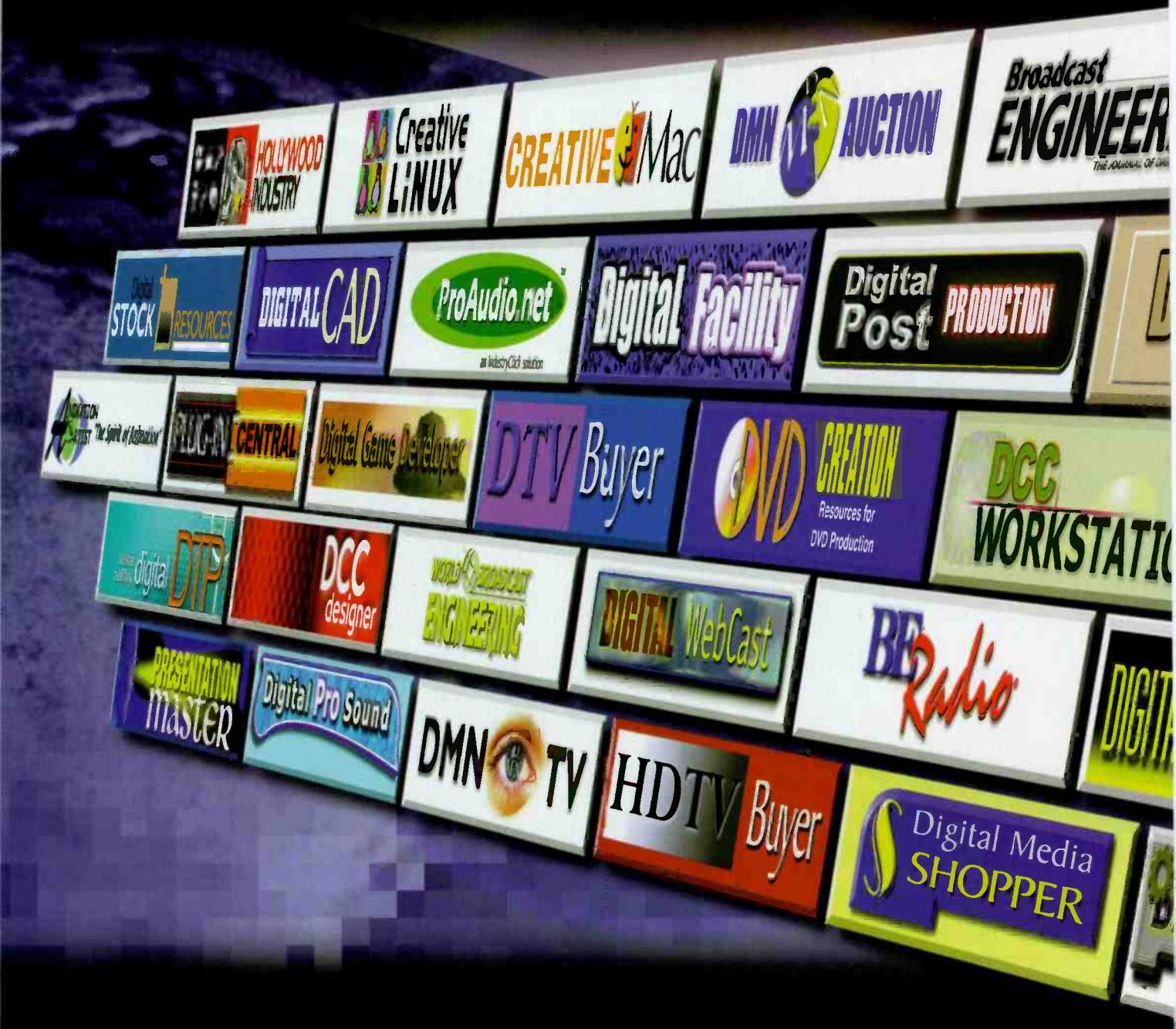

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How to Add Stations

If studios are built with similar designs and consoles given similar layouts, operators working at more than one station will be more comfortable in different rooms. Photo by Richard Gerlovich.

audio from anywhere to anywhere (and they simplify wiring). You may be able to provide cross connects and blocks for three studios in the space of one. You will always have analog signals from remotes, satellites, telephones, backhauls and RPUs. DAs should be restricted to air monitor feeds for each station. Audio feeds from computers, consoles and CD players can be either digital or analog. I would even put the EAS receiver on the studio routing switcher.

Consider locating the EAS encoder/decoder in engineering, then remote the functions to each control room. Other equipment, such as satellite receivers, audio delays and processing, and STL and T1 terminal equipment should also be located in engineering. Determine the location in each rack for each piece of equipment to get an idea of how much rack room you will need. Often, it seems, there is a need for up to 50-percent more rack space than is originally planned for. If possible, build the extra rack space into your plans.

Under construction

Once you have the plans, the next phase is construction. The general contractor you select must be familiar with studio construction and not only be able to follow the blueprints exactly, but also be able to catch omissions made by the architect and

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How to Add Stations

bring them to your attention. Communication is essential between the subcontractor and the architect. When selecting the general contractor, you might want to talk to each of his subcontractors to make sure everyone is on the same page. During construction, it is important to inspect work daily. You should also have a regular, weekly construction meeting with the general contractor, subcontractors and the architect to go over problems, delivery issues and coordination of work. Once a problem is sealed behind drywall or above a drywall ceiling, it is difficult and expensive to correct. Failure to caulk a seal or an HVAC duct above the ceiling can ruin an otherwise perfect soundproofing project.

Automated stations may be able to use a small production studio for limited on-air use. Photo by Richard Gerlovich.

Construction costs can vary greatly. General office construction runs between $14 and $25 a square foot, while studio construction can exceed $150 a square foot. In my most recent build, the owner did not want to spend the extra $60,000 for two additional studios, even though common studio walls were being used to cut construction costs. Without the additional studios, it was difficult for each production person to schedule enough studio time when the facility was finished.

Once a problem is sealed behind drywall or above a drywall ceiling, it is difficult and expensive to correct.

In short, planning is the most important part of a combined multistation facility. If you have doubts in any part of a consolidation, call for help. Paying for consulting help, as you need it, will spare you countless migraines in the future.

Robert Reymont is president of Double R Consulting, an engineering services provider in Mesa, AZ.

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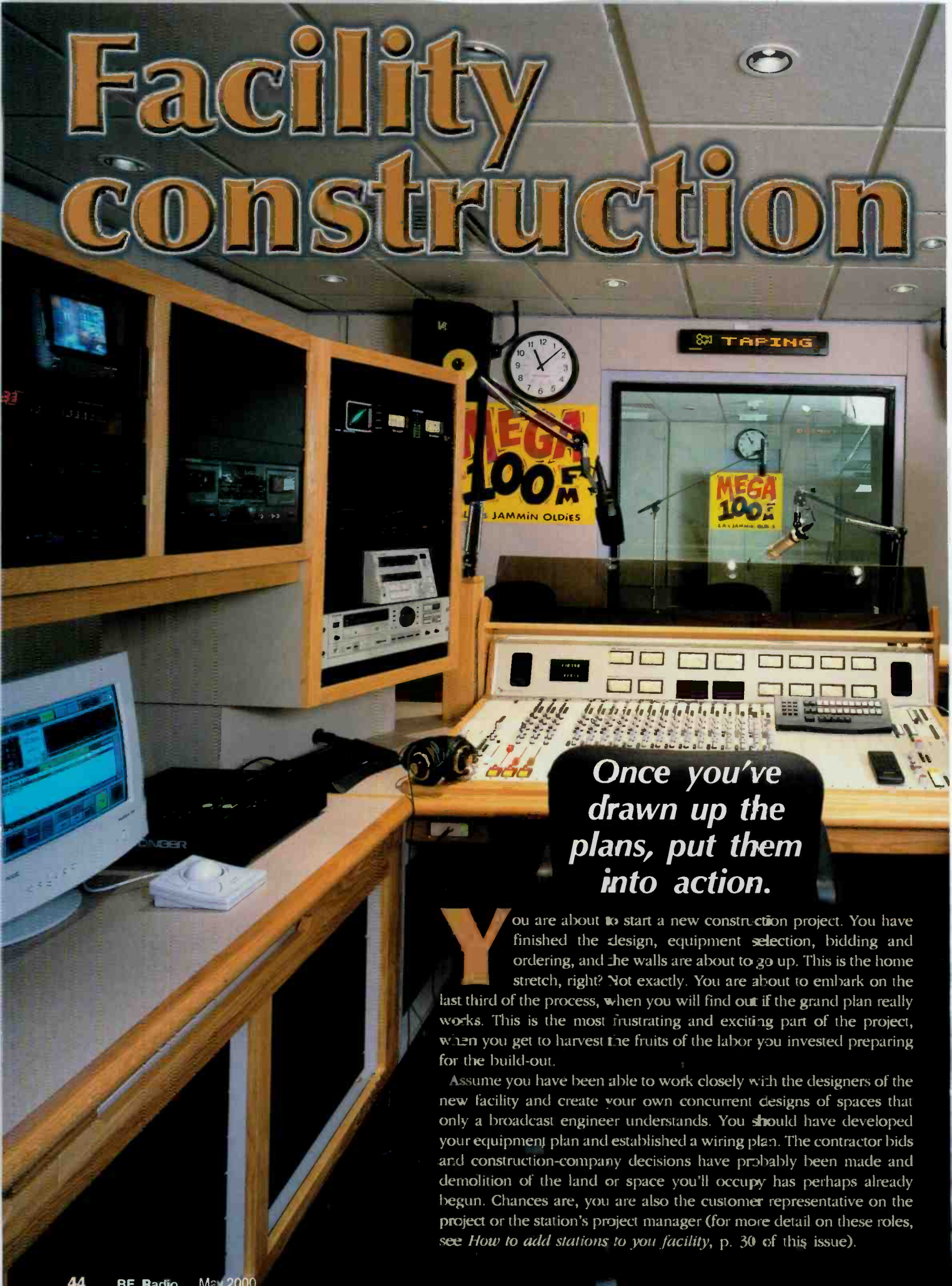
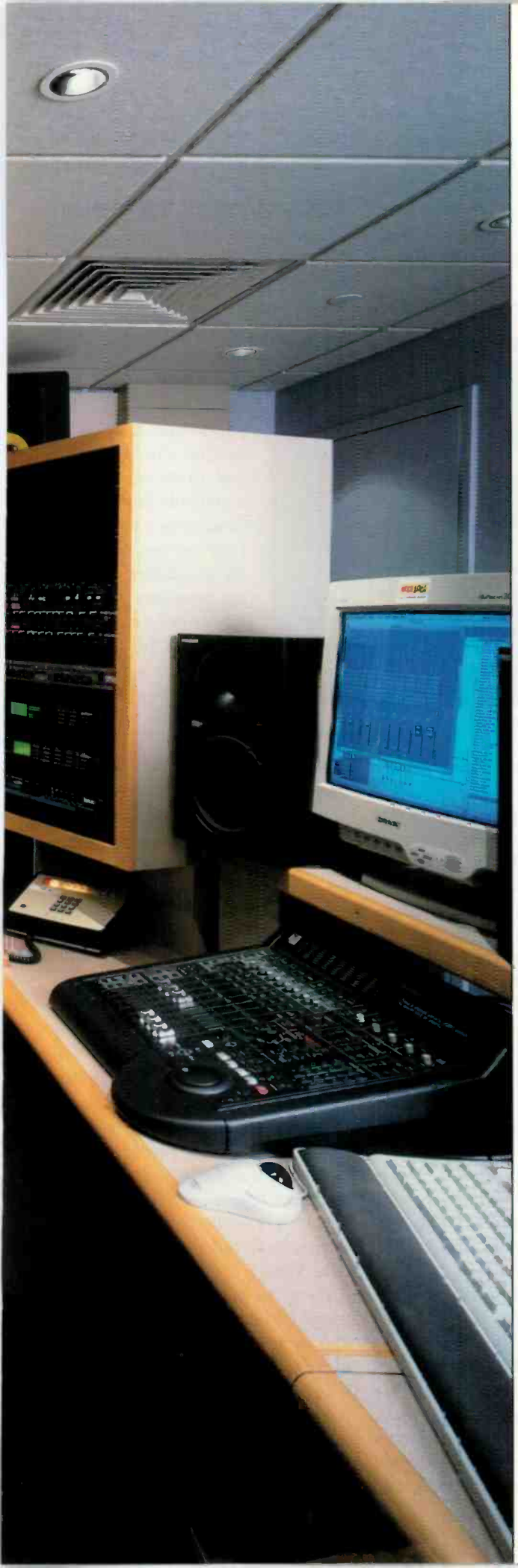


Once you've drawn up the plans, put them into action.

You are about to start a new construction project. You have finished the design, equipment selection, bidding and ordering, and the walls are about to go up. This is the home stretch, right? Not exactly. You are about to embark on the last third of the process, when you will find out if the grand plan really works. This is the most frustrating and exciting part of the project, when you get to harvest the fruits of the labor you invested preparing for the build-out.

Assume you have been able to work closely with the designers of the new facility and create your own concurrent designs of spaces that only a broadcast engineer understands. You should have developed your equipment plan and established a wiring plan. The contractor bids and construction-company decisions have probably been made and demolition of the land or space you'll occupy has perhaps already begun. Chances are, you are also the customer representative on the project or the station's project manager (for more detail on these roles, see *How to add stations to you facility*, p. 30 of this issue).



If you're a radio station chief engineer and you are handling this construction, you *must* delegate the day-to-day operation of the station(s) to someone else. You cannot successfully manage a project and engineer an existing operation. Both jobs will suffer, and you'll have to live with any poor decision you make on the new facility for a long time. In some cases, I have been able to find the budget for the extra person by building it into the construction budget. This approach allows you to concentrate on the project at hand without worrying about routine problems, such as the sales department printer or remote broadcasts.

Physical construction

While on site, connect with the construction superintendent managing your project. This person can be your worst enemy if you are at odds but will be an incredible resource if you can work together. You likely met this person during or just after the bidding process on the project. Once he or she is on site, find out when the weekly or biweekly progress meetings (e.g., with architects and foremen) are scheduled, and religiously attend them. Know when the superintendent schedules the foremen's meetings in case you want to be around for specific questions and answers.

Make sure contractors understand the client chain-of-command and responsibility. Ideally, you will be the single source of information for the construction company. If you're not that source, make sure no more than two people can give the construction company answers. Restrict the number of people providing information to the contractor and you will reduce the likelihood of having instructions be misunderstood. Even if you don't have major purchasing authority, you should be the connection to get to that person when the need arises. The same situation goes for the crew foremen. You'll be easily accessible, and they will want to run changes by you because you're the customer. Though instructions may come from you, they will be delivered by the superintendent. Make sure the super is either present or privy to exchanges with you and the foremen and assert that change orders will not be honored unless they are approved by the super — not the customer. The super is the boss on the site.

The importance of your interaction with the job superintendent cannot be overemphasized. This person has to coordinate all the crews, manage union issues, set up schedules, make sure permits and approvals have all been obtained and posted, and administrate the site's safety policies.

Once reasonable progress has begun, set up a work space or an office at the site. Work with the super on where and when to do so. I always put in a dedicated telephone and fax, in addition to the super's lines, to handle business. I have been able to share a work space with the super on a couple of projects, which was a great situation. In these cases, the super appreciated having ready access to the customer rep for the countless judgement calls that have to be made on the site. I appreciated the arrangement because I could be

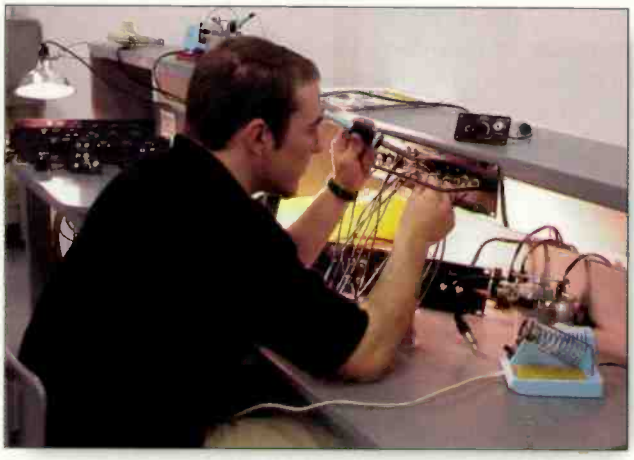
involved with all aspects of the construction and take advantage of the judgment calls to make a less-expensive and higher-performance facility. This setup enabled us to anticipate each other and shave weeks off the project's approval stages.

Once you are on site, your job will be to answer questions. On my first project, I told myself that I could do the wiring design of the broadcast studios during this part of the construction. This proved to be a huge mistake. In order to be most effective, interruptions *are* your job during construction. I ended up doing the design late at night instead in order to finish in time. Construction crews tend to work 6 a.m. to 3 p.m., which made for some long days.

Constructing a facility requires extra labor.

You should have a full construction set of the blueprints and be familiar with the conventions used. This is not just the space plan but a set of prints with the mechanical, electrical, low-voltage wiring (telephone/data) and HVAC designs. It's usually a voluminous pile of large-format paper. I like to tape the edges with painter's masking tape to keep the prints from being destroyed when they are shuffled. Most of the specific construction techniques and acoustic treatments should be outlined in this document. The more familiar you are with the full construction blueprint, the more you will be able to interject all those wonderful ideas you have gained from years of doing your job. Be wary of change orders, though; they get expensive. Let's hope most of the great ideas made it to the print in the first place.

During construction, do a few things to help generate excitement for your staff. First, post the space plan and, if you have it, a 3D perspective drawing (architects love doing these) of the completed facility in a prominent place where your staff hangs out, like the snack room or announcer lounge. This will serve as a reminder of the good things to come. As you see the construction site taking shape, you and the superintendent should schedule tours with the station managers. This will generate a buzz back at the office and help mentally prepare people for the move. These tours will also allow time for the managers to give their opinions on judgement calls you have made that affect them. Also, take plenty of pictures for posterity and later use. Specifically, take photos whenever you have installed special features you will use later (e.g., a reinforcement panel for hanging speakers). When all is done, these features will probably be hidden by paint or plaster, so you'll want pictures to help locate the anchor points without drilling probe holes or trying that stud finder.



Setting up a staging area that contains all the materials and references needed will make more efficient use of time and manpower.

Studio wiring and installation

When the physical construction of the studios is done, the wiring infrastructure will be placed, the furniture set up and the equipment installed. This is tedious because broadcast and pro-audio studio wiring is a slow process. Telephone and data wiring systems can be quickly and easily installed by marginally skilled labor. Connectors and cable systems are optimized for installation efficiency. Broadcast wiring is labor-intensive and designed to be done by technicians with specific skills. Not everyone can wire an XLR or RF connector.

Increasingly, broadcast system integrators can admirably handle this stage of construction. If the design work has been done properly, the entire station can be wired elsewhere and shipped to you for installation. There are advantages to using integrators like this. Standard wiring of a station can take weeks or months. You will not be able to gain access to perform the wiring until the facility is almost complete. By using a system integrator, the wiring and equipment setup can occur offsite while the walls are being built. The savings in time and local costs often offset the cost of using a system integrator. I highly recommend outsourcing as much of the wiring as possible that needs to be done during construction. It's kind of like arranging a just-in-time manufacturing process for studios. Some or all of the wiring can be done by an integrator to your specs. Some talented people are available, and there are some good companies to work with in the industry. Usually, the choice of a systems-integration company is wrapped up in the equipment choices, but it does not have to be. Do some homework on this and you may be surprised.

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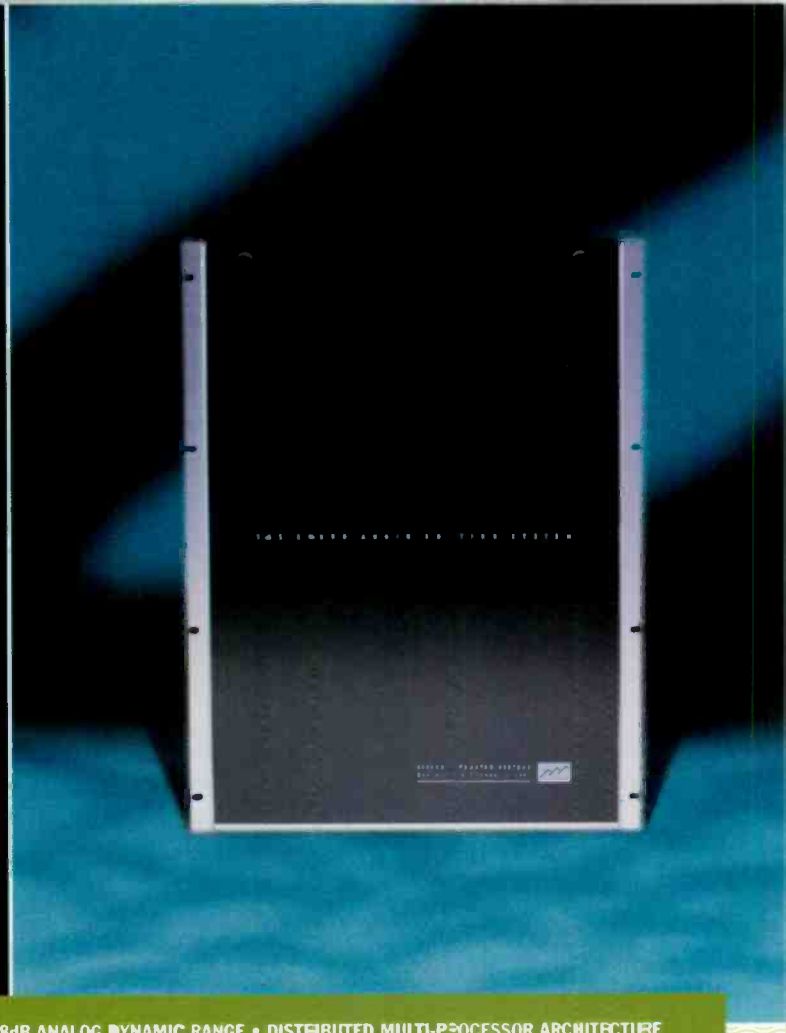

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Your wiring design of the whole facility was probably created one room at a time and merged to make a total wiring plan. If you have gone into full detail on your plan, considering even the cable connectors, you can accurately determine the length of time it will take to wire the facility (if you wire it yourself). The rule of thumb I use is one man-minute for each physical connection. For example, an XLR would take, theoretically, three minutes to make. Most of us with experience can do it in a minute flat, but you have to consider organization and wire management. A minute per physical connection is a rule of thumb. This rule can also be used to establish the budget for engineering wiring. The sooner the design is done, the sooner you'll know how long it will take and how much it will cost. Since you created the plan one room at a time, you should be able to take those plans and assign jobs to your crew, one room at a time.

Assembling cable and preparing wiring plans off-site will facilitate the installation process.

Try to divide machine cables and cross-connect cables onto separate sheets on your design. If you can plan for the cable lengths, you can outsource a substantial amount of this work. If you are not using a systems integrator for the whole facility, hand off machine cables to them or to any contracted help.

Make sure all ceiling and wall work is done before you install the furniture. Otherwise, construction crews have other descriptions for your expensive, high-tech broadcast furniture. They will use it as scaffold or treat is as if it's just in the way. Also, make sure your trunk cabling is pulled into the studio before laying down the furniture. It is amazing what gets in the way when you are pulling 32-pair snake cable through a floor trough. You also do not want to be underfoot when the crews doing your installations finish their work. In some cases, union rules will require the construction to be totally complete before your broadcast engineers start terminations and installations.

Start with the wiring backbone, the trunk lines that link all the studios. Terminate and complete every part of this backbone that you have planned, including your future expansion parts.

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Doug Lane, owner and GM of WWDL (FM), WICK (AM) and WYCK (AM), Scranton and Wilkes Barre, PA says he "saves more than $45,000 per year with Scott Studios' Voice Trax automation. While the investment was major for a small family company like ours, ***the pay back was fast and real***. And the savings are year after year after year.

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Doug Lane, Owner and GM, WWDL, WICK and WYCK, Wilkes-Barre and Scranton, PA

Doug's stations have used Scott Studios' Voice Trax systems for many years.

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Doug is now installing Scott's automated temperature announcer. He says, "Scott's features are great. The savings are even better! I wouldn't want to run my stations without Scott Systems!"

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Do not fall into the trap of finishing just enough to get on the air. If your base infrastructure is incomplete, you'll constantly be dealing with things you never finished. Chances are, you will have more people working during construction than at any other time. If you don't do the job now, you'll probably never have the people again to do the job right. Completing every planned detail leave you ready for last-minute changes in priorities.

On the subject of priorities, separate the studios and rooms that you will not be able to get into once you are on the air, and make sure your staff assignments allow you to finish these areas 100 percent. Besides the on-air studio, this may include news rooms and computer closets that will be difficult to take off-line later. The same rule applies here as in the backbone areas. You'll never have a better opportunity to work in these areas. If you are running out of time, leave production studios and areas that will have regular downtime until last. An incomplete production studio is much easier to work with than an incomplete on-air studio.

It is usually wise to have a large staging area for your studios where you can set up mock-ups of studio layouts outside the cramped space of the actual studio. If you have a large enough crew, you can have one group installing the furniture and equipment while another is staging the next room. This is also a good place to post your facility conventions (e.g., color codes, termination standards, labeling requirements). Use this staging area as the central information point for your entire project, if you can. If you can't, make sure you have one designated. That way, your crew knows where to find information and manuals without asking you.

As project director, don't plan to be particularly effective as a wiring installer. You need to be traffic director and answer person. If you try to get into a wiring rhythm, you'll keep getting interrupted when your installation crew has questions. These interruptions are part of the job, so make sure you have assigned yourself quick jobs or tasks that you can start and stop easily. Remember that you are managing the project and you don't have to carry the labor entirely on your shoulders. Depend on and learn from your installers because they bring different experiences to the mix that can strengthen your plans. If your installers aren't asking you questions, find some who will. This will keep you honest and fresh.

When it's all said and done, stick around for the shakedown cruise for at least a couple of weeks after sign-on. Try to keep part of your crew around to help run down the inevitable bugs and cases of infant mortality. If you don't, you'll find that you're pulled in too many directions to be able to solve any problems. When it's all over, take a long break and do something completely different to clear your mind.

Barry Thomas is director of engineering for Comedy World Network, Los Angeles. Construction photos on pages 46 and 48 courtesy of RDA Systems.

Studio SUPPORT

By Ron Bartlebaugh

Your studio equipment is useless without the furniture to support it.

Studio furniture is perhaps one of the most important components of any facility because it allows the employees and the equipment to interface. All studio furniture performs two basic functions. First, it must be designed in such a way that it supports the studio's equipment and the required infrastructure for that equipment. Second, the furniture must be designed ergonomically for everyone who uses it. Ergonomic studio furniture will result in a more comfortable, alert and focused user. Properly designed equipment that correctly positions the announcer/producer in relation to the equipment can also prevent repetitive strain injury, carpal tunnel syndrome and muscular skeletal disorder, all of which can be caused by an uncomfortable furniture design.

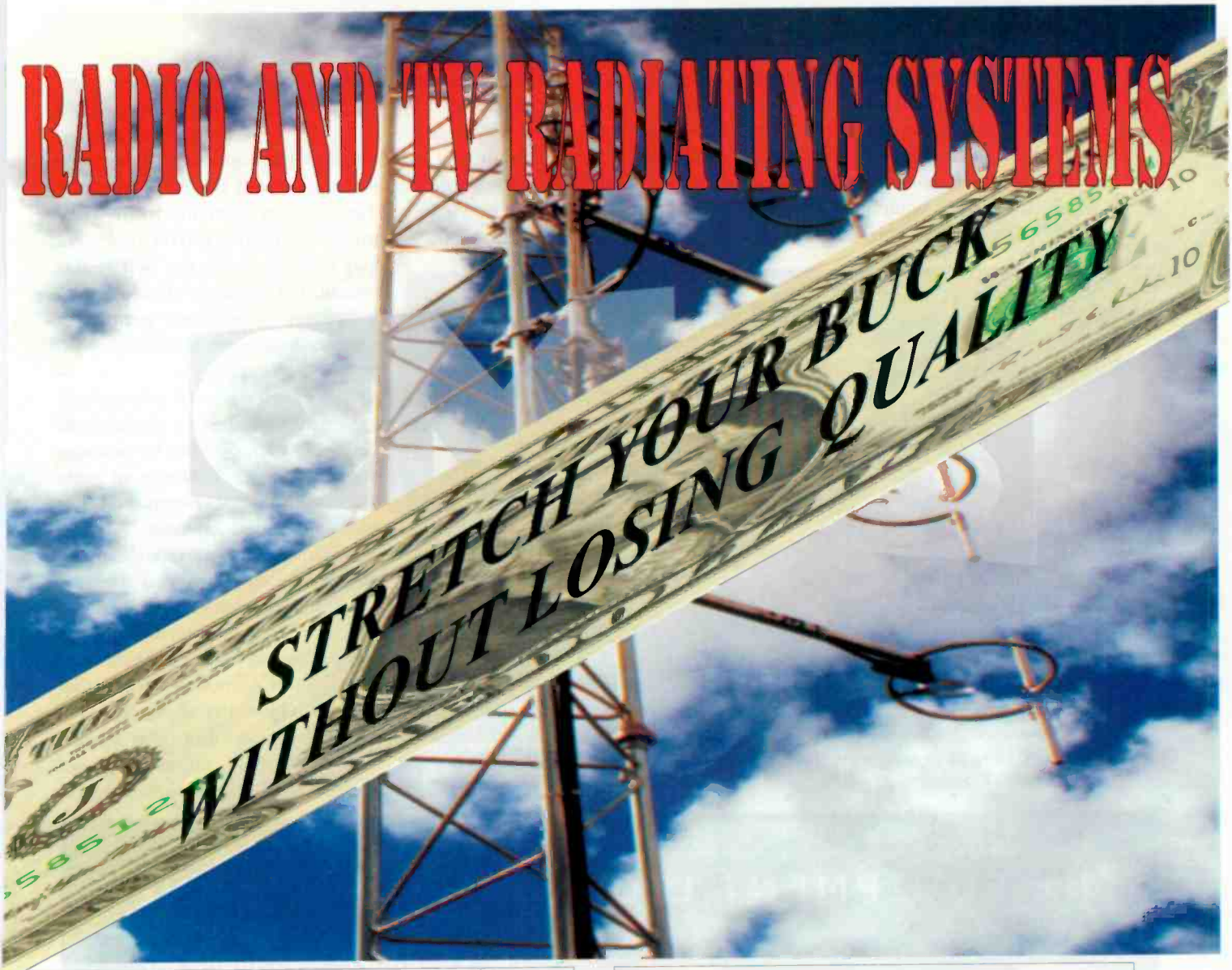
Studio designs of the past have been replaced with more complex designs that include computer monitors, keyboards and other related equipment, including but not limited to the infamous audio-mixing console. These trends in audio and video technology have necessitated a flexible cabinet design. A properly designed and installed furniture system can greatly enhance the overall function and appearance of a facility, and modular and custom furniture designs do not present the same limitations as steel racks and work surfaces.

Layout dictates furniture needs

When selecting studio furniture, perhaps the first question to ask is how the furniture will be used. Many CAD-based design programs are available to help the studio-furniture designer establish the absolute best design. Most furniture manufacturers also offer design services for custom applications. When designing support furniture, remember important items such as the need for all user-operated equipment to be within reach of the operator. Be sensitive to

Studio furniture can be functional and transform a studio into a showcase. Photo of Z-100 by John Farrell.

RADIO AND TV RADIATING SYSTEMS



FM Antennas
Medium power circular polarization

SGP-1	$690	4Kw
SGP-2	$2,690	8Kw
SGP-3	$3,595	10Kw
SGP-4	$4,500	10Kw
SGP-5	$5,300	10Kw
SGP-6	$6,100	10Kw

FM Antennas
Low power circular polarization

GP-1	$350	1.5Kw
GP-2	$1,350	3Kw
GP-3	$1,900	5Kw
GP-4	$2,600	6Kw
GP-5	$3,150	6Kw
GP-6	$3,700	6kw

Other power configurations contact OMB America

FM Antennas
Educational circular polarization

MP-1	$250	0.6Kw
MP-2	$680	0.8Kw
MP-3	$980	0.8Kw
MP-4	$1,280	0.8Kw
MP2-4	$1,820	2Kw
MP3-5	$2,270	3Kw
MP3-6	$2,740	3kw

3100 NW 72 Ave # 112
Miami, Fl. 33122
Tel:305-477 0974
Fax:305-4770611
ombusa@bellsouth.com

www.omb.com

the fact that a short person's reach will be far shorter than a tall person's. When in doubt, assume the operator will be short and have a short reach.

Design each layout so the most-frequently used equipment is located at the center of the layout. In most cases, this means the audio mixing console. All other equipment should flow from and around the design's focal point. If computer monitors are part of the design, place them in such a way that they can be viewed from a comfortable operating position. When considering the view angle of each monitor screen, again take into consideration the average height of your operators. If the angle were optimized for a tall operator, then a short operator might have trouble reading the text on the screen, and vice versa. For the best results overall, the monitors should be installed on mounts that permit the operator to tilt each monitor vertically for best viewing.

The space below racks provides a place to store equipment and supplies that are not in use. Photo by Connie Kramer.

If the monitor is to be permanently locked in place, then the designer can best serve each operator by positioning the monitor's surface at an angle that is an average between the tallest and the shortest operator. All keyboards and computer mice should be placed in such a way that they are ergonomically correct as well.

If using equipment turrets, be sure they are placed in such a manner that they do not restrict sight lines that may be required (e.g., to co-hosts, guests, producers and other studios as well as clocks, timers and other equipment or control surfaces). It is

Position computer monitors so they are easy to see. Photo by John Farrell.

always a good idea to cover the surface of each turret that may be opposite a microphone with a sound-absorbing material. When doing so, use a sound-absorbing material that is at least 2 inches thick; this will best absorb low frequencies. In some cases, the equipment turret(s) may need to be elevated to clear the audio mixing console surfaces. A designer can make good use of the area underneath an elevated turret by placing the telephone and other peripheral equipment there, but don't forget about ergonomics. Make sure user-operated equipment within each turret is within easy reach of the central operating position for all operators.

Make the furniture functional

Every studio-furniture design should also include a designated area within the furniture for mounting punch blocks, accessory equipment, grounding circuits and a work light. Where possible, a large fold-down panel works well for mounting punch blocks. The fold-down feature enables the engineer to easily work with the blocks without having to be a contortionist. If the fold-down feature is not possible because of space limitations, then an internal vertical panel well-mounted to the furniture framework also works. This option is somewhat less convenient than the fold-down panel. This area is also a good location for terminating the facility technical ground to all equipment ground circuits.

Electrical distribution for all equipment located within or around the studio furniture can also be located in this area. Take the necessary precautions, however, to provide proper isolation between electrical and audio wiring as required. A main-power shutoff switch for all equipment within the furniture may also be located in this same area. Be sure the electrical service to the furniture is protected with a properly-rated fuse set or circuit breaker and proper surge protection. If an uninterruptible power supply is to be used with equipment housed within the studio furniture, be sure to design a location within the furniture base for that unit as well.

Equipment rack rails should be well-located where necessary for the secure mounting of equipment in areas such as the equipment turrets or below counter cabinets. Equipment

Studio Support

manufactured using the standard 19-inch rack format will actually require an opening of 19¼ inches because of the width of the rack rail. Areas where equipment rack rails area to be mounted should be made of a sufficiently dense material to support the cumulative weight of all equipment to be located within the opening.

Often, the space underneath the top side of studio furniture goes unused. This area is a great location for console power supplies, patch panels, compact-disc racks, mic processors, and anything else that needs to be located close to the operator or equipment but does not require frequent access. In addition, the space can be nicely used for integrated storage drawers that are always handy for storing writing utensils, logs and patch cables. As a designer, plan to use every conceivable space within the studio furniture in the most efficient manner possible.

Local cabinetmakers may offer quality work, and there's no shipping charge. Photo courtesy of the Lawrence Group.

Wire and cable

Cable management is always a factor in furniture design. Cable routes should be well-planned within the infrastructure of the furniture. Always be sure to have cable access to all areas of the furniture where equipment is to be housed, including the equipment turrets. Large plastic clamps similar to those used for clamping PVC conduit or plastic water pipe to walls make great cable retainers. They are even more beneficial in areas of high RF intensity. For areas with multiple cables being run, telephone company style D rings are a proven favorite. For more complex cable routing, plastic cable-management trays provide an excellent means of keeping things orderly and easy to access. These trays can also hide and protect any cable runs that are exposed outside the furniture. Be sure to document all cables at both ends, including AC power cables.

Equipment ventilation must always be included in any good studio-furniture design. Ventilation panels are best integrated into the removable panels of the furniture. In some cases, where larger volumes of heat may be generated, additional panels may need to be built into the sides or even the top of the furniture surfaces. Be sure to

install panels in the lower surface as well as the upper surface area(s). In almost every case, a cabinet can be made to be naturally ventilating. This design will eliminate the need to install any type of fan within the structure.

Counter tops

Many other design criteria should be considered when designing studio furniture that is expected to interface the operator to the equipment in a user-friendly manner and last for years. One detail to consider is the use of nonglare laminate. This will provide for a visually comfortable environment. Some laminates also are available with a carbon layer embedded within them. Using this material for counter tops allows engineers to install a stud through the counter top that is then connected to the facility technical ground. This is an excellent procedure to use for the reduction of static electricity.

Counter top and cabinet edging should be decorative as well as functional. Wood trim is often used; however, it can be damaged easily. Most furniture manufacturers offer an excellent line of choice vinyl trim that provides a nice decorative touch which is nearly indestructible.

The cabinet base should be placed on a riser of 3 inches to 4 inches to prevent damage at the bottom of the cabinet from accidental kicks. Be sure to account for the riser height in your overall design height measurement. Furniture corners should always be of the proper radius to eliminate uncomfortable, inconvenient and dangerous square corners. Studio furniture should always be placed in such a way that it properly integrates with room lighting, HVAC systems and doors. Arrange all lighting so it will not cast shadows on work surfaces.

The final design

Once you have this information and you know whether the room will be a stand-up or sit-down operation, the designer should be able to make intelligent decisions about the studio-furniture layout required for each facility. Many broadcast-furniture manufacturers offer a variety of products from which to choose. Most local cabinet shops can also provide some quality products if they have a detailed design to work from. You may be able to mitigate the additional cost of custom, locally manufactured furniture when you consider the freight costs involved when purchasing from a manufacturer hundreds, if not thousands, of miles away. You will also need to investigate local building codes for any special requirements including those for people with disabilities. Finally — and this is perhaps the best suggestion of all — always be sure the furniture fits through the doorway.

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

FOR MORE INFORMATION
Circle (207) on Free Info Card

New Products

Mic systems
Audio-Technica

▶ **AT895 Adaptive-Array:** Uses the DSDA-PRO acoustically tuned element mic array and special analog circuitry. Provides adaptive directional acquisition of sound sources. Output of the array is manipulated and filtered by acoustical, analog and digital means to enhance the pickup of a sound source from a desired direction relative to unwanted background noise or interference, providing cancellation of up to 80dB.

330-686-2600; fax 330-686-0719; www.audio-technica.com; pro@atus.com
Circle (260) on Free Info Card

Audio console software
Logitek

▼ **VMixNet software:** Brings out individual fader strips anywhere on a TCP/IP network PC, local or remote. The program is accessed by connecting a PC to Logitek's Audio Engine. The VMIX host program is run on the PC. The PC is also connected

to the TCP/IP network. Any workstation on the network can then run one or more VMixNet fader strips. Each fader strip can hook to one of several audio engines. Each VMIX host is identified by either a PC network name or an IP address.

800-231-5870; fax 713-782-7597
www.logitekaudio.com
info@logitekaudio.com
Circle (262) on Free Info Card

FM digital processor
Orban

◀ **Optimod-FM 8400:** Has more than five times the DSP power of the 8200 as well as new features. Its intelligent peak-limiting system and look-ahead compression are highly advanced, offering a clean, loud sound without distortion, trashed baseband or pilot-tone modulation. Selectable soft, medium and hard bass clipping. The limiting system eliminates the need for compromising either voice distortion or music loudness, allowing even loud, highly processed presets to offer pristine live speech.

510-351-3500; fax 510-351-0500; www.orban.com; custserv@orban.com
Circle (250) on Free Info Card

Professional duplication drive
MediaFORM

Smartdrive2: Selectable speeds of up to 12×and electronic watermarking (SmartStamp and SmartRid). Information is encoded to each disc, acting as an electronic fingerprint. The information resides outside of the user data track, ensuring compliance and making the same information transparent to the user. Encoded information includes recording date and time, a user-definable system number and the SCSI channel and SCSI ID number of the drive that wrote the disc along with a user-selectable alphanumeric data field.

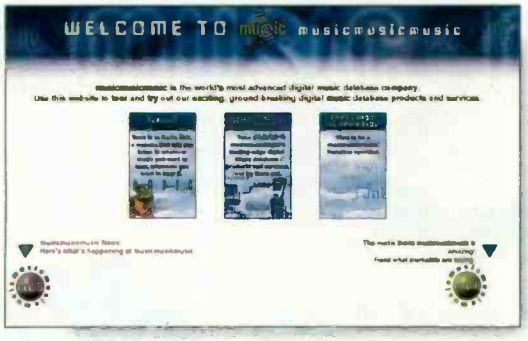
800-220-1215; fax 610-458-9554
www.mediaform.com; info@mediaform.com
Circle (267) on Free Info Card

Desktop mixing system
Thum + Mahr GmbH/Yellowtec

▶ **Intellimix:** A full-function, compact mixer for applications where only a few channels of audio are needed at one time. The control surface is the interface to the digital mixer/router. Includes two mic inputs, five AES-3 inputs, one S/PDIF input and five analog line-level inputs. Each input can be routed to one of the three faders and includes an alphanumeric display. Other features include pre-fade cue, several digital and analog outputs, two stereo mix-minus outputs and talkback functionality.

+49 2173 967336; fax +49 2173 9672400
www.yellowtec.com; info@thummahr.de
Circle (281) on Free Info Card

Windows to the Web



www.musicmusicmusic.com

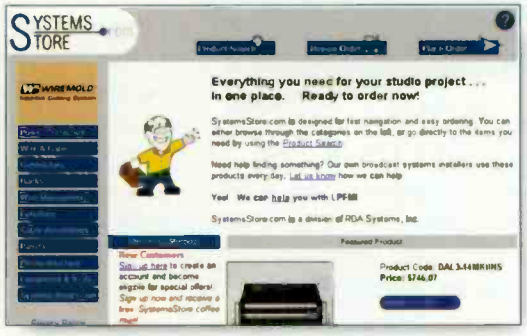
musicmusicmusic: We bring our database of music to you, with the absolute best in Internet music delivery. By employing cutting edge technology, we provide turnkey solutions for all of your music database needs, as well as Web design, completely customized music for your website and a wide range of promotional tools. Be a part of the future of Internet music now. Check out our website at www.musicmusicmusic.com.

www.antex.com

Antex Electronics: If you're looking for the most versatile, best-sounding sound cards for broadcast applications, it's time to look at Antex. Browse through Antex's complete line of analog and digital-ready products, read independent product reviews, get in-depth technical information, check out high-end applications of Antex products in the Sound Advice newsletter and buy products securely online. Already a customer? Download drivers, software, owners manuals and more.

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.



www.systemstore.com

SystemsStore.com: Doing your own studio systems project? This site has everything you need, including advice! Assembled by the experienced staff at RDA Systems, the site has over 2600 items including racks, cable, connectors, cable ties, D-rings and punchblocks, all from well-known names like Belden, Gepco, StudioHub, Panduit, and Neutrik, and much, much more. New items are added daily and everything is available for ordering on-line!

www.logitekaudio.com

Logitek Electronic Systems: Manufacturer of digital audio consoles plus a full line of audio meters. Visit our website for information on the NUMIX, ROC-5 and ROC-10 digital audio consoles. You'll also find information on our DSP-based audio meters, offering a range of displays while conforming to IEC standard ballistics. Logitek — digital with a better difference!

www.radiosoft.com

RadioSoft: The industry leader in the development of radio engineering software. Fifteen years of software development have been brought together in ComStudy 2.2, today's leading software package. This leading edge technology is being used by federal agencies, state agencies, coordinating bodies broadcasting stations as well as many two-way radio and cellular planners. Visit our website and see the very latest radio engineering software.

New Products

Stereo recorder
Maycom Automation Systems

▶ **Handheld recorder:** High-quality stereo recorder with MPEG encoding/decoding. Features extended temperature range, a rubber grip, a built-in high-quality mic and removable compact flash cards. Also features a large, illuminated graphical display, a connector to an optical docking station and a balanced input for an external mic. Standard batteries, a smart battery pack, a headphone connector and an internal speaker are included.

+31 481 377740; fax +31 481 377380; www.maycom.nl; sales@maycom.nl
Circle (278) on Free Info Card

Intraplex Intralink-IP
Harris

▲ **Multiplexer:** The IP audio transport is designed to support future commercial use of IP-based, CD-quality, real-time stereo audio over Ethernet links for a variety of applications. These include delivery of audio content to servers or server networks for webcasting using streaming technologies as well as use of IP transport of programming across local and wide area networks.

800-622-0022; fax 513-459-3890
www.harris.com; broadcast@harris.com
Circle (255) on Free Info Card

Broadcast mic
The Hollywood Edge, Soundelux Micro

R-1: Features a large-diaphragm condenser and produces recording studio audio quality as well as a 1-inch diaphragm transformerless FET and gold-on-Mylar diaphragm. The high SPL capability (138dB), high sensitivity (20mV/Pa), low self-noise (9dB"A"), low power consumption (1.31mA) and internal windscreen are packaged in a rugged, all-metal design.

323-603-3228; fax 323-603-3245
www.soundelux.com/mics
Circle (266) on Free Info Card

Digital power meter
Bird Electronic

▼ **Model 5000 Thruline:** A handheld directional RF power meter combining a digital display with the ability to accurately measure power in analog and digital RF systems. Its compact size, rugged construction and rechargeable NiMH battery make it

ideal for use in the field. Features backlit digital display, simple menu commands and five dedicated speed keys. Provides average, true average or peak measurements of 0.1W to 10,000W with ±5 percent accuracy, and automatically calculates VSWR, return loss and match efficiency.

440-248-1200; fax 440-248-5426
www.bird-electronic.com
sales@bird-electronic.com
Circle (261) on Free Info Card

Audio processor/stereo generator
Energy-Onix

Maximizer III: Integrated control of three-band audio, matched to a sophisticated digital stereo generator. Easily adjustable controls. Delivers loud music without distortion.

888-324-6649; fax 518-758-1476; www.energy-onix.com; energy-onix@energy-onix.com
Circle (273) on Free Info Card

New Products

Field recorder
Nagra

▶ **ARES-P:** Designed for single-handed operation, with dimensions of 7.4×3.15×1.1 inches. Records three hours and 15 min in stereo at 128kb/s (192MB card). Battery life is 4 hours, and it takes five AA alkaline batteries. 20 bit Sigma-Delta A/D and D/A conversion. 16-, 24-, 32-, 48kHz sampling frequencies. Uses PCMCIA Flash RAM type I and II recording media. Recording mode is digital compressed; G.722, MPEG Layer II. Mic, mono and stereo, phantom, ALC and sensitivity-selectable inputs.

615-726-5191; fax 615-726-5189; www.nagra.com

Circle (277) on Free Info Card

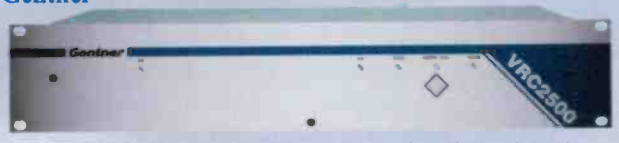
Modular digital console
Audioarts Engineering

D-70: All input modules feature A/B switching and all digital inputs have standard sample-rate conversion. Has analog and digital outputs for all four stereo mix buses. Its serial communication mates seamlessly with a station's automation and routing systems. Includes control room and studio monitor modules with separate source-select and studio talkback. A dual-caller phone section has a DSP-generated mix-minus and separate record outputs.

252-638-7000; fax 252-637-1285; www.wheatstone.com
sales@wheatstone.com

Circle (276) on Free Info Card

Transmitter remote control
Gentner



▲ **VRC2500:** Easily programmed to identify and evaluate problems that may arise at a remote site and take whatever corrective action is needed. The action and current site condition are then communicated to the station's engineer via telephone, pager or data transfer. Manual adjustments can also be made from virtually any location using a telephone keypad or PC. The unit can respond verbally over the telephone, or it can display conditions on a PC monitor.

800-945-7730; fax 801-977-0087; www.gentner.com; bcastinfo@gentner.com

Circle (264) on Free Info Card

Converters and distribution amps
Radio Design Labs

Digital audio interfaces: This family of eight devices handle tasks for digital uses and covers S/PDIF and AES-3 applications for D/A converters, distribution amplifiers, program selectors and format converters. All of the units include RDL's Sure-Lok circuitry to reinitiate the digital clock before passing any signal.

800-281-2683; fax 805-684-9316; www.rdlnet.com; johng@rdlnet.com

Circle (281) on Free Info Card

New Products

Digital audio codec
Musicam USA

▲ **Prima LT Plus:** Contains three digital interface slots that can hold any combination of ISDN terminal adapters, V.35, X.21, RS422 or RS530 interfaces. Users can send stereo audio to up to three locations and mono to six locations simultaneously via ISDN. Bonds multiple ISDN lines to send audio at rates of up to 384kb/s, and supports all standard bit rates through its other digital interfaces. Has 24-bit A/D and D/A converters, AES/EBU digital I/O standard, and gold-plated Neutrik connectors.
732-739-5600; fax 732-739-1818
www.musicamusa.com; sales@musicamusa.com
Circle (257) on Free Info Card

On-air console
LPB

Blue 5c: Features RJ-45 Ethernet and CAT-5 connectivity, two independent headphone amps, heavy-duty mil-spec switches, a mono telephone bus and 10 stereo inputs. Also has a stereo cue bus, five stereo channels, a stereo program bus, and input-follow-remote starts. Transformer balancing for RF immunity. Ideal for LPFM, webcasting and remotes.
610-644-1123; fax 610-644-8651; www.lpbinc.com; lpbinc@aol.com
Circle (271) on Free Info Card

ISDN digital hybrid
Telos

▼ **Telos Two:** Gives users the flexibility to connect to digital ISDN telephone lines as well as traditional analog POTS lines. Enables broadcasters to take advantage of superior hybrid technology and new call-management

features immediately, and to gain enhanced audio quality and call setup features once they make the transition to digital telephone lines. Contains two digital hybrids in a single rackmount unit.
216-241-7225; fax 216-241-4103; www.telos-systems.com
Circle (252) on Free Info Card

AudioScience

Linux driver: Enables multistream recording, reproduction and mixing of MPEG-1 and PCM digital audio on a PC platform. The HPI APIs are supported under Linux kernel version 2.2 and higher. The driver uses large adapter buffers to provide high-performance, glitch-free audio under all operating conditions.
302-324-5333; fax 302-738-9434
www.audioscience.com; sales@audioscience.com
Circle (279) on Free Info Card

New Products

Furniture-line additions
Middle Atlantic Furniture

EC-SPK36, S24DG, DT8G: New additions to the company's furniture line include the EC-SPK36 Edit Center speaker stands, which feature dual cable-management channels to accommodate powered and passive monitors. Constructed from high-mass materials for resonance damping; rubber feet and carpet spikes are included. The S24DG, a 24-space vertical enclosure system, features integral noise reduction and cooling with built-in doors with gaskets and a filtered quiet fan system. The DT8G is an eight-space tabletop rack that can be incorporated into existing Edit Center systems to deliver more enclosure capability.

973-839-1976; fax 973-839-1976
www.middleatlantic.com
sales@middleatlantic.com
Circle (256) on Free Info Card

Powered subwoofer system
Yamaha

▲ **SW10:** A bi-amped monitor speaker designed for broadcasting. Provides exceptional sonic quality and an extremely flat response over a wide listening area. An 8-inch long-throw woofer housed in a bass-reflex design cabinet provides deep and tight low-end reproduction. A 1-inch pure titanium dome tweeter with a wide-dispersion waveguide horn provides a smooth, high-frequency response to beyond 40kHz. Internally powered, the unit's 120W for low frequencies and 65W for high frequencies optimize this speaker's sound quality.

714-522-9011; fax 714-522-9522
www.yamaha.com/proaudio
Circle (253) on Free Info Card

Electronics reference books
CJ Publishing

▶ **Electronics tutorial books:** *The Transistor Handbook* and *The Diode Handbook* are the latest additions to this series of technical books written for engineers and technicians in the electronics and electrical industries. Both books contain practical theory and circuit-level applications.

913-764-3577; fax 913-764-8909

Circle (232) on Free Info Card

New Products

Solid-state FM dual transmitter system
Nautel

◀ **Quantum 20/20:** Comprises two 20kW standalone FM transmitters that are fully integrated to operate as a 40kW active reserve-transmitter system. Single or dual digital exciters with coherent drive components are included. System controls, metering and diagnostics for 40kW operation are incorporated within the dual Quantum 20 cabinets. Three standard configurations are offered.

902-823-2233; fax 902-823-3183; www.nautel.com; info@nautel.com
Circle (268) on Free Info Card

Dual effects processor
TC Electronic

M•One: Features 100 presets, and you can store up to 100 presets in the user bank. Comes with a dual engine structure, ¼-inch balanced jack I/Os, S/PDIF digital I/O (24 bit), 44.1kHz to 48kHz internal processing, various routing options and more than 20 high-quality algorithms.

805-373-1828; fax 805-379-2648
www.tcelectronic.com; info@tcelectronic.com
Circle (270) on Free Info Card

WebVault
Broadcast Electronics

Internet audio studio system: Designed for the collection, organization and broadcast of professional audio over the Internet. Offers AV Air, AV Sat, AV Production and AV Scheduler. Also offers additional traffic and music-scheduling software plus AV Web, the newest addition to the AudioVault software line, which streams data along with the audio to create dynamic HTML presentations.

217-224-9600; fax 217-224-9607
www.bdcast.com; bdcast@bdcast.com
Circle (275) on Free Info Card

Telescoping mast safety package
Will-Burt

▲ **D-TEC:** Includes four safety features: a bright, focused look-up light at the top of the mast to illuminate the area above the mast, a tilt detector to warn if the system is not vertical, a unique AC detection system designed to electronically sense voltage-carrying wires, and a sophisticated anticollision system to detect overhead obstructions in the path of the extending mast.

330-682-7015; fax 330-684-1190
www.willburt.com; mastlite@willburt.com
Circle (254) on Free Info Card

Audio management system
Computer Concepts

EpiCenter: Accepts all audio formats and reroutes them in real time, in digital or analog, to any location. Less space is required for rack configurations. Simultaneously records, encodes/decodes, stores and plays back hundreds of audio events. Allows you to manage operations over multiple locations. Configurable to accommodate operations of any size.

800-255-6350; fax 913-541-0169
www.ccc-dcs.com
Circle (274) on Free Info Card

New Products

Compact two-way loudspeaker
Hafler Professional

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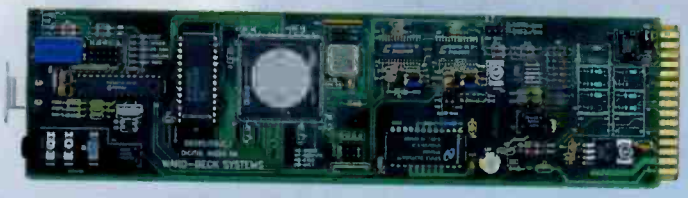

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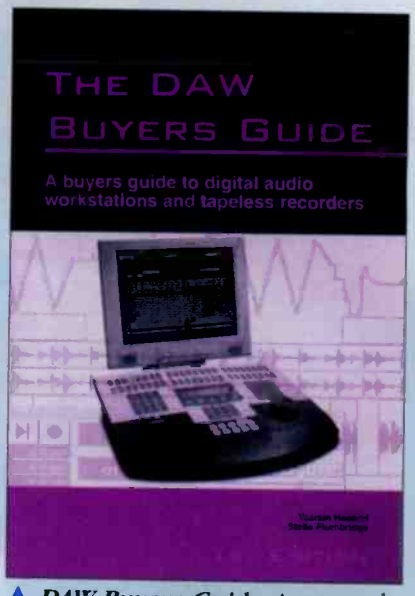

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Steve Floethe is the CEO of Advantage Productions, Inc., in Fort Myers, FL.

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Photo: WBBC Production studio; Jon Miller, courtesy Hedrich Blessing Photographers, Chicago

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Center of attention

By Skip Pizzi, executive editor

Those of us who cover the radio industry have noticed increased attention from the mainstream press lately. "How will the horde of new technologies that deliver audio to listeners affect the radio industry," they ask.

None of us has the answer, of course, but it's been enlightening to explore the possible outcomes — which range from minimal disruption to wholesale extinction of the industry. Statistically speaking, the most likely scenario falls somewhere in the middle.

Ear time

In the graphics and video domains, windowing techniques allow multiple sources to be viewed and consumed simultaneously. Similarly, the term *teleweb-bing* has been ascribed to the surprisingly popular phenomenon of watching TV and surfing the Web simultaneously. Audio does not follow this trend, however. Most users will only listen to one source at a time, which places a relatively fixed limit on the number of audience hours available to audio providers. Therefore, as any new services gain ground, radio must necessarily lose some.

Where the ears are is also important. At present, new technologies based on the PC — such as Internet radio and downloaded-file listening — have stolen ear time mostly from fixed locations. Traditional radio still owns the mobile and portable ears. (Ironically, Internet radio has actually *added* some radio listeners at the workplace, where PCs with high-speed Internet connections — and not radios — are provided by the employer. This no doubt contributes to recent research that indicates more people are using Internet radio than are downloading MP3 files.)

The next wave of the attack will take on the automotive and portable listener bases, however, as S-DARS and broadband terrestrial wireless services emerge. Here radio retains an economic advantage with free-to-the-user service, which newer technologies will likely never offer, given their reliance on subscription models.

But if the new services add sufficient value, users will sign up and employ the services, thereby stealing more ear time from radio. So the relative value ascribed by users to each service's *content* will be the ultimate arbiter in this competition.

Content types

To minimize lost ear time, radio broadcasters will have to do two things: 1. Improve the value of their existing services (i.e., localize), so current listeners are more satisfied and less likely to seek alternate offerings; 2. Launch new secondary content efforts that can be delivered by other services. Among the latter, S-DARS is not much of an option (due to its mostly proprietary content), but any Internet-associated service, such as broadband wireless, is fair game.

Simply repeating the same content from the over-the-air service won't cut it.

The key to success in alternate markets will be to repurpose content appropriately, however. Simply repeating the same content from the over-the-air service won't cut it. Digital services allow more than just audio, and more than just real-time delivery, so radio broadcasters will have to adapt their creative abilities as the boundaries between content types are blurred.

Creating the right business model for these new services is a separate but equally critical challenge. There is a cost burden that comes with the addition or revision of content types, and there may be a corresponding need to reinvent the revenue chain associated with these enhanced services. This should not be viewed as purely a defensive strategy designed simply to hold onto listeners, but rather as an aggressive bid to create new income streams. A number of different models are emerging in this space, all of which warrant observation by broadcasters. (We will explore several of these in upcoming issues.)

Finally, let's acknowledge that even the most successful new service is unlikely to ever fully *replace* radio. Rather, it will fit alongside radio in the menu of media options that tomorrow's consumers will have available to them. Nevertheless, broadcasters will still need to be proactive in the struggle for retention of aggregated ear time.

It's flattering to be a target of such attention. No one would be interested in stealing its thunder if radio didn't already own a dominant share of the media market. But when you're number one, there's only one direction you can move in relative position. Sheer momentum won't keep radio atop the heap anymore. It's going to be hard work to maintain that position, but with the right set of content offerings and sensible migration to new delivery technologies, radio broadcasters could actually extend their position to even greater dominance. Conversely, should broadcasters fail to meet this challenge, there will be no shortage of eager heirs to its fortunes.

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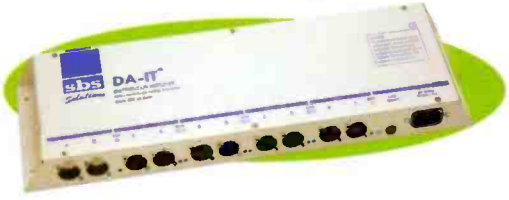

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