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August 1999
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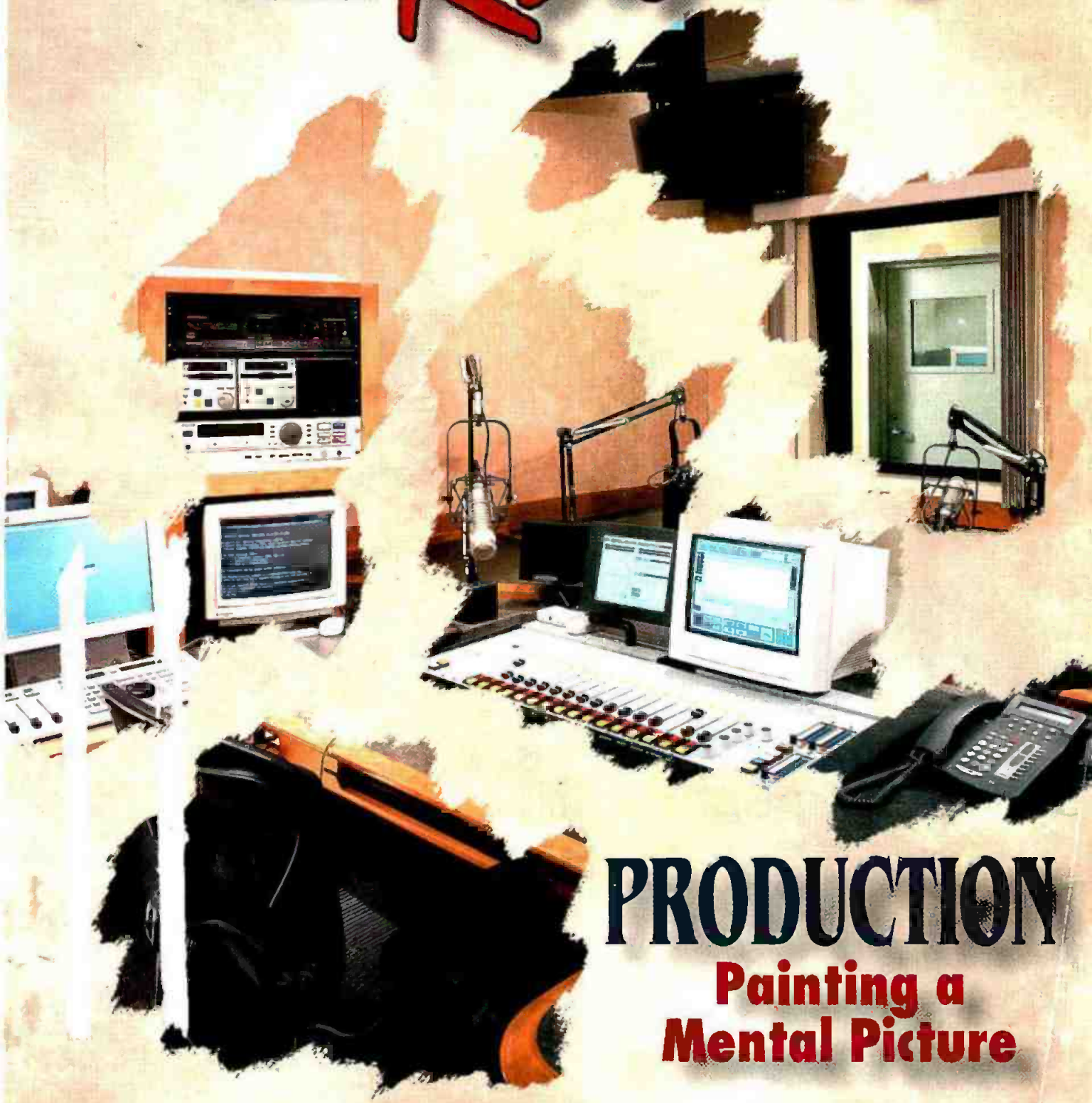

PRODUCTION

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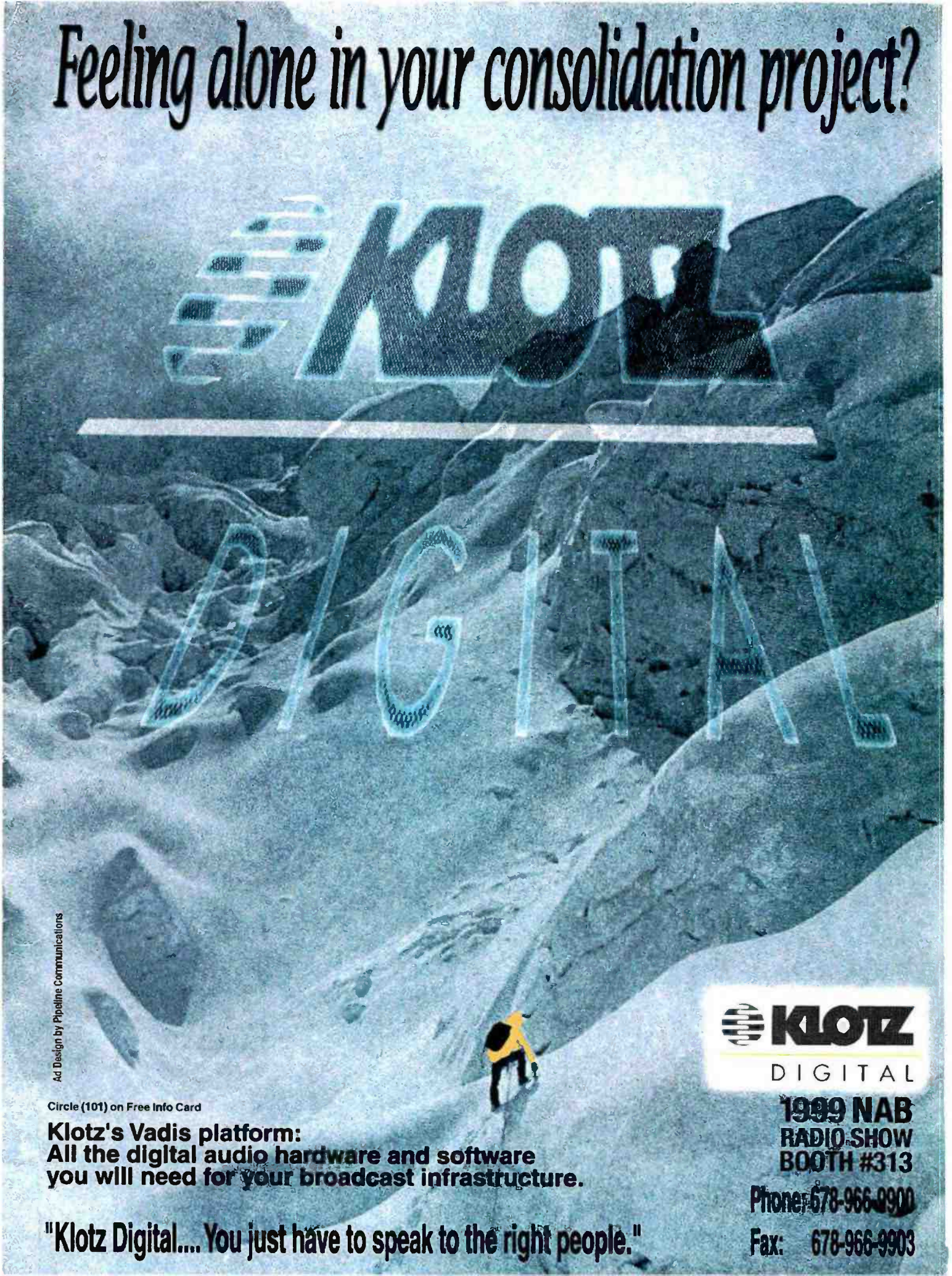

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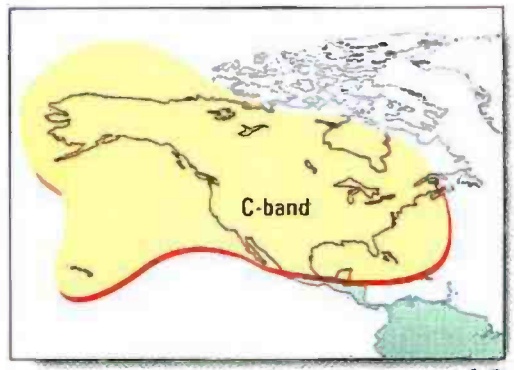

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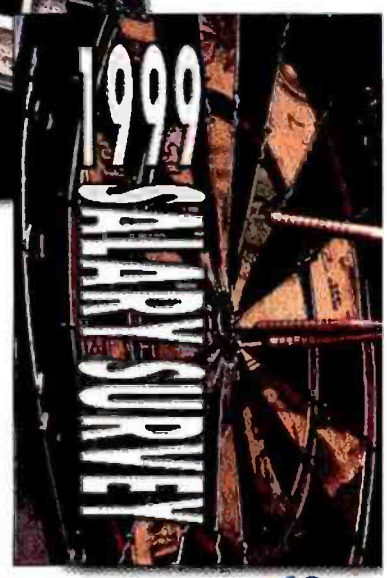

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UNIVERSAL STUDIOS FLORIDA RADIO
Online

ON THE COVER: Radio production can create exciting metal images. (Photo of WIBC-AM at the Emmis Communications World Headquarters.) Cover design by Michael J. Knust. Studio photo by Jon Miller of Hedrich Blessing, Chicago, courtesy of Ratio Architects, Indianapolis.

When you compare the all-digital Omnia.fm from Cutting Edge to other audio processors, is it apples to apples? Not quite. Unlike other audio processors, the Omnia is designed for today–and easily upgradable so you're always on top of the technology you'll need tomorrow.

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- **A 48kHz sampling rate.** The outdated 32kHz digital processors have a Nyquist rate that's too low for clean dynamics processing, resulting in aliasing distortion. But the Omnia solves this problem by combining 48kHz operation with 192kHz virtual-upsampling and an anti-aliasing final limiter.
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- **Programs and presets** stored on a PC Card for convenient storage, sharing and future upgrades.

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Viewpoint

On netiquette

Electronic communications have undoubtedly become integral to the way you do business. Internet access has moved beyond the novelty of visiting as many websites as possible. The Internet and e-mail are tools, and using them properly will help you do business more efficiently.

I spend a substantial amount of time online maintaining two websites and monitoring four e-mail addresses. For me, e-mail has become the best method for collecting and sending information. I also subscribe to several e-mail lists. On some, I simply monitor the activity; on others, I actively participate. The following tips are the result of some of the annoyances I encounter every day; I hope they make your electronic interactions more efficient.

E-mail is text-based. For this reason, it is not necessary to write a short message in a word processor and then attach it as a file. Not only are the word-processor files larger than the plain text would be, but also an extra step is involved in reading them.

Special formatting is not necessary. More and more messages have substantial HTML coding imbedded in them. These messages may look great when the formatting is decoded, but the purpose of reading the e-mail message is to get its content. We don't need to see the message changing fonts and colors.

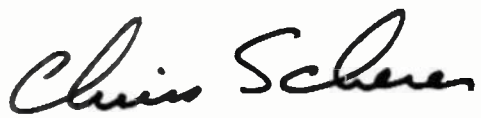
Reply to messages properly. This seems to have become a lost art. When replying to a message from a mailing list, there is seldom a need to include the entire message simply so you can add a few comments. Edit the original message down to the essential points being addressed, and then post your reply. Don't remove too much of the original message or the thread will be lost. Furthermore, don't reply to a message without any reference to the original. Hitting reply without including some of the original text leads to responses that are meaningless.

Treat electronic discussions as such. Speaking of meaningless replies, discussions on a list are usually not polls. Replying to a thread with the message "me too" or "I agree" does nothing but waste bandwidth. An e-mail discussion should add information as it is passed, not simply show a nod of heads.

Turn off the cardfile attachments. I use one mail reader that downloads and stores each attachment in a directory. I routinely delete a plethora of .vcf files that have been collected. To add to this, when the same v-card file comes in, a suffix is added and then it is saved. Along this line, if you have a signature file on your messages, reduce it to the necessary elements: name, company and contact information. We don't really need all that ascii art.

Don't send attachments in a list server. Some lists have several hundred or even thousands of subscribers. Unless the list is designed for mass distribution, your attachment will be sent to many people who do not want it. I always seem to get these messages while I'm on the road and connecting through a hotel PBX at 14.4kb/s with a long-distance connection. Rather than sending an attachment, FTP the file to your website and post a message that the file is available online.

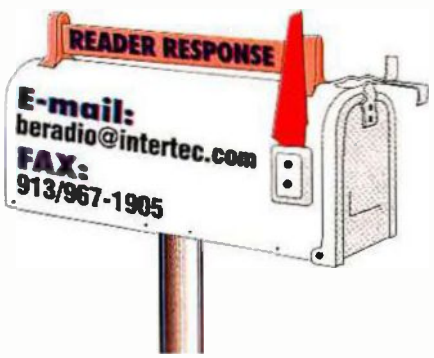
Increased connection speeds have made it easy to forget about how much bandwidth is being wasted with these Net offenses. Feel free to comment on any these tips. Just keep the replies short and to the point.

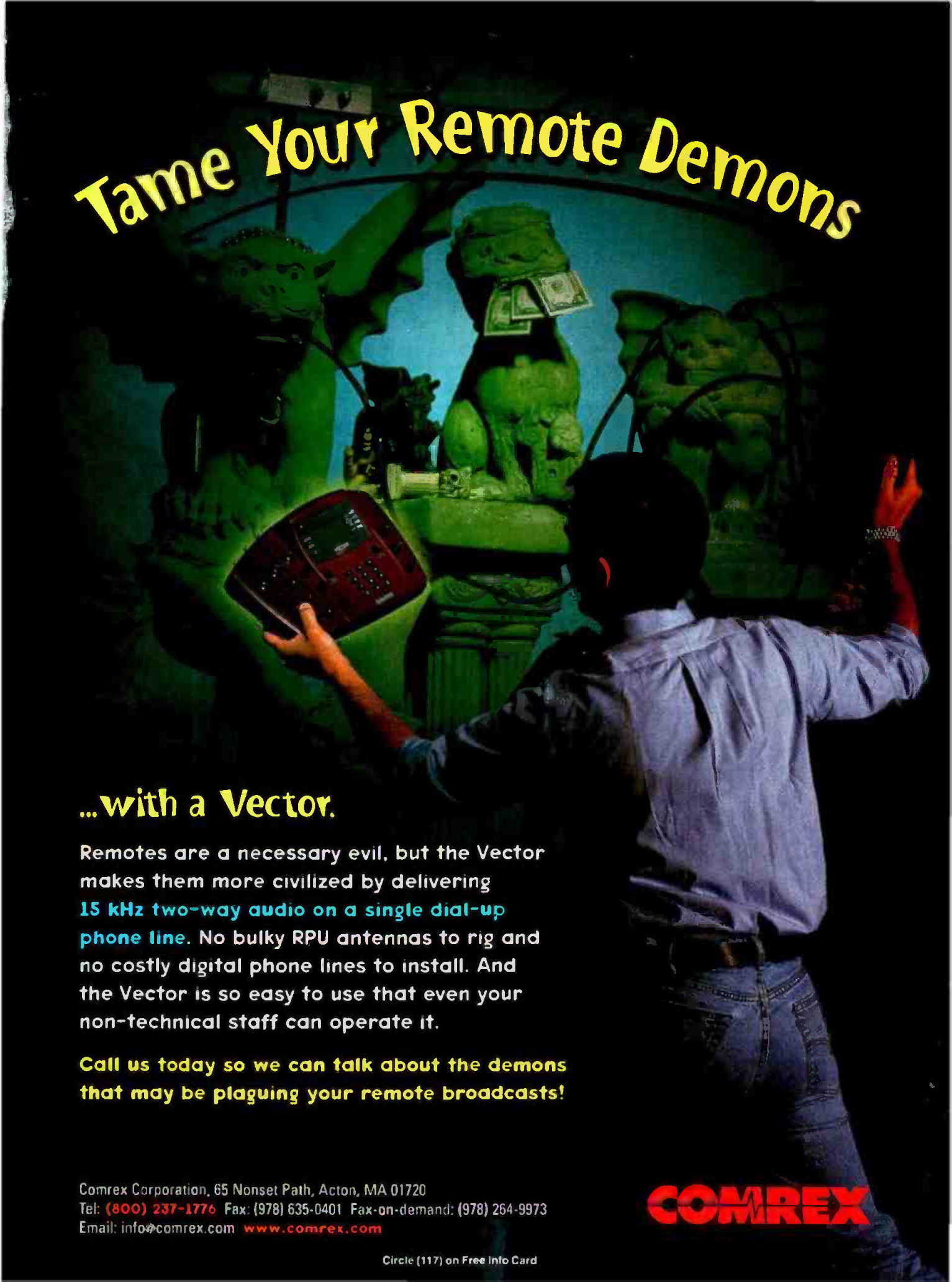


Chriss Scherer, editor

On the road:

Chriss will co-moderate the *Digital Facilities Workshop* at the NAB Radio Show in Orlando, FL. The workshop will be held September 1 from 8:00 a.m. to 5:00 p.m. and will include presentations on computer-based audio and networking and maintenance in a digital environment as well as two panel discussions, one on the Internet and IP for radio and one on the current status of IBOC DAB.

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Getting better business

By Kirk Harnack

What contract engineer wouldn't like to pick and choose his daily work, selecting only the jobs and assignments he truly enjoys — and leaving the others for someone else? As a contract engineer, your work probably won't be enjoyable every day, but you can garner clients who offer the type of work you prefer. Doing so will make a big difference in your job satisfaction.

You can incorporate brief notes on technical issues in newsletters to fill leftover space and convey important ideas quickly.

Determine your strengths

Choosing which jobs you want depends largely on your ability to turn down those you'd rather not take on. That ability, in turn, depends on having enough preferable business to make the kind of living you want.

As contract engineers, we often think we must be jacks of all trades. Many of us unwittingly fall into this role. Fortunately, having good skills in all areas of broadcast engineering isn't necessary for success as a contract engineer. What's important is identifying and pursuing the types of jobs that give you fulfillment. Then, network with other engineers, technicians or skilled laborers to perform the tasks you don't care for or that are far below or above your level of expertise.

First, focus on choosing the type of engineering work you are good at and prefer. If you're detail-oriented and like project planning, then you may want to pursue installation and construction work. If you consider yourself a people person, then studio maintenance and remote broadcast setup and supervision may be a good direction. If you love to travel and don't mind a flexible schedule, consider international contracting work.

Give serious thought to the kind of projects or tasks you prefer and that challenge you. Think about the scenarios in which you tend to work best. Where have your skills and ingenuity as an engineer been successfully put to task? Putting yourself in situations where your skills are challenged yet you are confident of the outcome will help you develop personal satisfaction in your profession.

There is a point to this exercise in skill determination: focusing your efforts on getting the type of new business you want. Once you are confident in the direction you want your career to take, you can direct your promotional efforts toward that end.

Promote your work

The key to getting new business is your reputation. Being fair, honest and forthright with your clients is the best means to ensuring your future success. Building a reputation that wins business is a lengthy process. It is, however, certainly worth the effort. No amount of advertising and promotion can overcome a shoddy or shameful reputation.

Many contract engineers find newsletters effective for promoting themselves to current and potential clients. Keeping clients informed about engineering issues raises awareness of how your skills can benefit their stations. A short, concise newsletter with a picture or two tends to be read, especially if the stories are written specifically for the manager or station owner.

Instead of mailing your newsletters, fax them. A one-page newsletter can be faxed to several hundred recipients overnight at a cost of less than $40 for long-distance faxes. An e-mailed newsletter is even less expensive to distribute, but is perhaps less likely to be read and kept for future reference.

Writing an interesting newsletter every month is easier than you might think. Page-layout and publishing programs for PCs and Macs come with templates and wizards to make the presentation look professional. You'll just need to write a few paragraphs of salient content that relates to your readers' needs.

Whether you choose to produce a monthly or quarterly newsletter, make an editorial schedule to guide you through each issue. You can create your own editorial schedule in a few minutes. Think through the calendar, noting the important engineering issues that arise about the same time every year. For example, if you like making NRSC compliance measurements, remind your readers about them in April or May. You can even include a coupon on your newsletter offering a discount for early scheduling of the measurement. In August or September, remind your readers to do preventive tower maintenance before the onset of winter weather. An article about backup power-generator maintenance is also appropriate. During mid-autumn and late winter, address the

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Each modular input wedge features a huge display screen above six P&G faders. Input routing, bus assign, stereo mode, pan and EQ settings are clearly shown for each channel. We even provide a separate timer for each input and space for automation systems to write song titles.

These consoles have four mix busses, talkback, mix-minus, pan, mute, snapshot automation and an amazingly flexible remote control system. Optional features include motorized faders, EQ, dynamics and talk show delay. Of course both analog and digital ins and outs are handled with ease.

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upcoming remote broadcast season. Discuss proper remote-equipment testing and maintenance as well as operator training.

You don't have to write every article in your newsletter. Equipment manufacturers are a ready source of prewritten texts. Visit the websites of tower manufacturers for suggested maintenance procedures and schedules. Check transmitter equipment manuals for general maintenance procedures and rationale. With permission from the authors, these and other sources can turn your newsletter writing efforts into a cut-and-paste exercise while yielding a professional and meaningful document.

Tips and techniques are a good way to fill leftover spaces in a newsletter — and they serve a useful purpose. The illustrations show how a small leftover space can be put to good use.

When creating your newsletter, bear in mind your intended audience. Don't get lost in technical jargon. Write your headlines and stories to appeal to station ownership and management, and demonstrate how engineering issues bear on a station's reliability and marketability.

Get the message out

Traditional advertising in targeted print media will heighten awareness of your skills and services. Use publications read by those with authority or interest in hiring you. You can also focus your advertising message on the target audience. For example, in a publication about ownership and management, point out the benefits of your due-diligence inspection service. To advertise your skills at producing competitive loudness through processing, you can advertise in a magazine aimed at program directors.

No matter how you advertise, be certain your message speaks to the audience. Make sure it offers something they want or need. You should also advertise work you like doing; otherwise, your new business will be a burden rather than a welcome challenge.

Make yourself easy to reach. Posting half a dozen telephone numbers for radio stations where you might be found isn't a professional approach. Get a sophisticated answering machine or service, one that pages you immediately for emergencies. This approach will allow you be reached anywhere with just one telephone number. If potential clients can't reach you quickly to ask a question, they probably won't call back later.

Appearance matters

It doesn't hurt to look sharp. One contract engineer who likes to project a professional image carries a cotton coverall in the car. When there's dirty work to be done, he dons the coverall over his regular office clothes. When the dirty work is done, he returns to being a well-dressed professional.

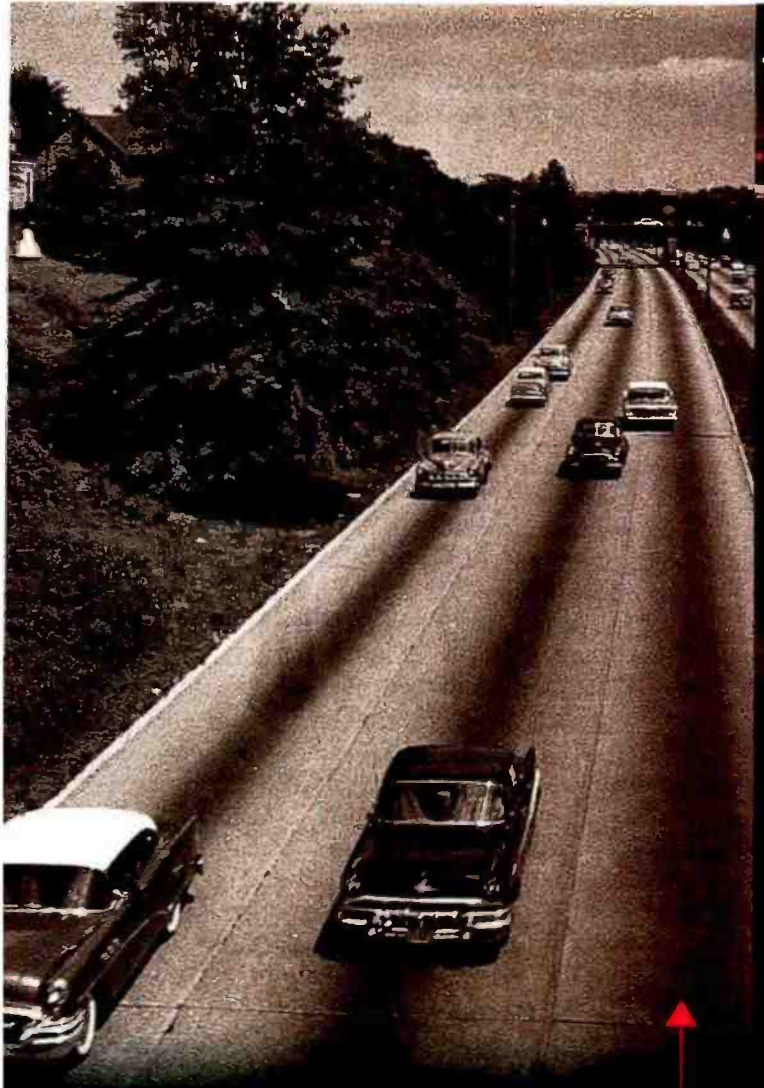
If you aren't comfortable working in office attire, consider wearing neat, pressed khakis and a clean button-down shirt as opposed to worn jeans and an old T-shirt. These clothes will allow you to get down to work without sacrificing a presentable appearance.

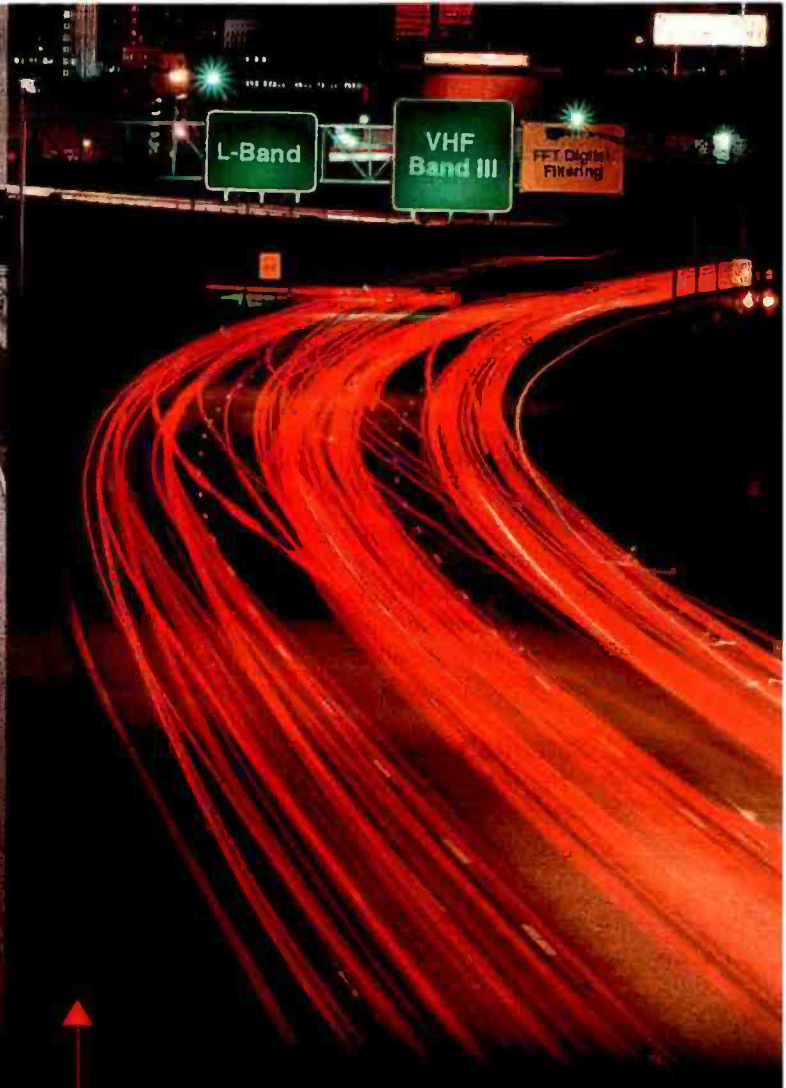
Be prepared

Once you've gotten new business, you'll need to be prepared to handle it. Make sure you have the training, tools and time to properly conduct your chosen tasks. A few minutes of planning will often prevent the necessity of return trips and lost opportunities.

There are many aspects to getting new clients in your business. Being prepared to take on the added business is critical. Gaining a good reputation, and promoting it, will inevitably bring clients to your door.

Kirk Harnack is president of Harnack Engineering Inc., a contract engineering firm in northwest Mississippi. Contact Kirk at www.harnack.com.





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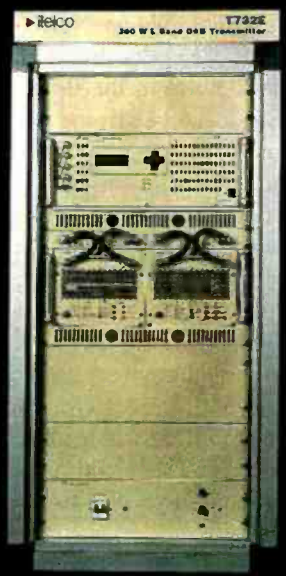
Digital Drive Time.



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Satellite for 2000

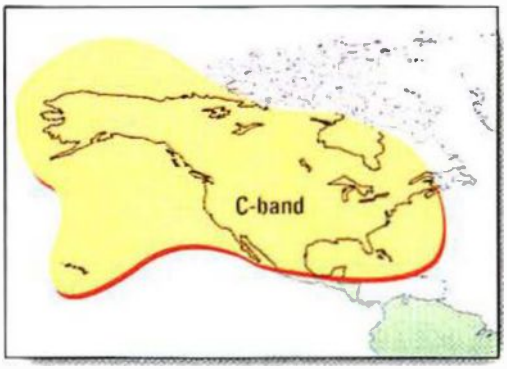
By Eric M. Wiler

Satellite distribution has become a major component of the U.S. radio industry. Over the past two decades, many stations have begun taking a portion and, in some cases, the majority of their programming from satellite feeds.

As we move into the next millennium, exciting changes in satellite distribution technology will enable stations to use their satellite feeds in ways never before possible.

Satellite's launch

The radio industry has used satellites since the early 1980s, when the Scientific Atlanta DATS system was installed for the distribution of programming from ABC, CBS, NBC and RKO Radio Networks. This system employed cutting-edge features, including digital audio (before CDs became the media of choice for music), BPSK modulation, forward error correction and data broadcasting. The system launched using Satcom F1R; this eventually became the radio neighborhood.



The footprint of the proposed GE-8 satellite is identical to Satcom C5, but delivers nearly twice the output power.

DATS was originally designed for up to 20 384kb channels of information. These channels can include 15kHz audio, 7.5kHz audio, voice cue channels and data/closures. In the early 1990s, ABC improved the platform of DATS with the deployment of SEDAT (Spectrum Efficient Digital Audio Transmission). SEDAT improved the audio quality by using DSP technology to compress the audio to 128kb/s per 20kHz audio channel, making it possible to broadcast more than 60 channels on a single transponder.

The DATS/SEDAT system has functioned with finesse for many years. DATS has made the transition from Satcom F1R to Satcom C1 and now to Satcom C5. Yet, with the system approaching two decades of service, it is time to examine the advances in audio compression, modulation and information dissemination.

The future

Although Satcom C5 has been radio's satellite for many years, all great things must come to an end. Satcom C5 will cease to function in 2001. GE Americom has committed to the launch of a replacement at the same orbital location (139 degrees west). With its newer design, GE-8 will offer the immediate benefit of an increased footprint power, which covers the continental U.S., Alaska and Hawaii.

Significant improvements have been made in many areas of satellite and audio technology, and it makes sense to implement them. Audio compression has advanced far beyond SEDAT. The worldwide standard MPEG Layer II algorithm has been in operation since 1991. The software allows for data rates from 64kb/s to 384kb/s per stream. Each stream can provide mono, stereo and joint stereo, with quality ranging from voice grade to near-CD quality. Layer II has undergone extensive testing for transparency, ensuring the highest quality. Furthermore, MPEG has no commercial ties to any particular company, making it less likely to be limited to proprietary applications.

Since the inception of DATS, *biphase shift keyed modulation* (BPSK) has become a less widespread standard, giving way to more efficient schemes, particularly *quadrature phase shift keying* (QPSK). Simply put, QPSK modulation can transmit twice the amount of data in the same space as BPSK. With MPEG and QPSK, it is possible to transmit hundreds of audio channels on a single transponder. The disadvantage of QPSK is its sensitivity to phase-noise in the downconverter section of the LNB. Phase-locked LNBs are the best method for QPSK reception.

DVB (digital video broadcasting) is an open standard for the transmission of *multiple channel per carrier* (MCPC) signals via satellite. Developed for use in systems such as DirecTV and Echostar's Dish network, it is possible to combine multiple MPEG streams into a single data channel. Although DVB provides an excellent foundation on which to design a system for radio, several layers of information are not necessary for audio broadcasting.

It is also now possible to include audio storage facilities in the satellite receiver. Flash-memory technology allows the reception of data/audio files to a solid-state device. While hard disks offer an option for storage, they prove to be less reliable because of the mechanical nature of their design. What benefit can audio storage offer a station? No more missed feeds. With older technology, stations recorded material when the network fed it down

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the audio channel. This was sometimes done in an automated fashion, using reel-to-reel tape. If the machine was not threaded properly, was in safe mode or the tape broke, the solution was to call the provider and request a re-feed. With digital storage technology, you simply go to your receiver and request playback of a file to record to your digital audio system, reel or cart. The control of the playback is, for the first time, in the hands of the radio station.

Future capabilities will provide Ethernet outputs, which connect directly to your local area network. TCP/IP-type protocols allow the user to connect the receiver to any type of LAN (e.g., Windows NT, Novell), since the open standard of IP is universal. When a new receiver is directly connected to the satellite receiver, the network can e-mail the files to your system in a standard MPEG format used by the majority of automation systems.

Many stations rely on satellite delivery of programming and data. A quality antenna and LNB are important for reliable reception.

These areas of improvement barely scratch the surface of future satellite-distribution developments, and new systems must be open-architecture platforms to allow the inclusion of future features. Your new receiver will provide you with an extremely high-speed connection to your providers, who will in turn supply anything that can be digitized: audio, text, HTML documents and even video.

Preparing for the future

All this gee-whiz technology sounds great, but what should you do to prepare for the new receiver platforms?

Most stations' satellite dishes simply are not up to the task of receiving these new signals. Since radio's move to space distribution in 1983, the spacing between satellites has decreased from 4 degrees to 2 degrees of separation.

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A professional-quality 3.8m (12-foot) solid antenna is essential. Some stations try to squeak by using home-type mesh antennas, but newer delivery systems simply will not function properly with these antennas. Audio dropouts and loss of material are inevitable with a substandard antenna.

Once you have purchased the proper antenna, you must correctly align it. To aim a dish for digital reception, you must use a professional-quality spectrum analyzer designed for the task. Home satellite installers with cheap signal meters or video analyzers cannot achieve the proper alignment. The process is simple: minimize interference. Signal meters cannot determine whether you are peaking your signal or adjacent satellite interference, or if the polarization setting is wrong.

The installation of a pro-grade phase-locked LNB is the final step to moving into the next millenium.

The installation of a pro-grade phase-locked LNB is the final step to moving into the next millennium. The good news is that an LNB requires standard RG-6 coaxial cable rather than the inconvenient and expensive hard-line used in the older systems. When selecting the LNB, contact the vendor of your receiver for an approved model. The overall noise-temperature rating used by consumer satellite vendors is far less important than the phase-noise characteristics.

Overall, remember that this is your programming source. Skimping a few dollars on a cheaper dish, LNB or installation can cause years of aggravating problems.

The next generation of satellite receivers will offer many enhancements, including MPEG audio, DVB multiplexing optimized for audio, Ethernet distribution of data, onboard data storage, QPSK modulation for increased capacity to allow more nationwide distribution channels, and an open architecture to allow the incorporation of future technologies. A digital audio network being deployed for Clear Channel Communications/Jacor implements this technology.

When satellites were first used for radio distribution, disco was a viable radio format and IBM was introducing the AT 80886-computer platform. Just as you no longer use turntables as the primary source of music, the new capabilities of satellite technology warrant changes that will move our industry beyond the year 2000 with unparalleled flexibility.

Eric Wiler is vice president of engineering for NSN Network Services, Denver, CO.


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Circle (108) on Free Info Card

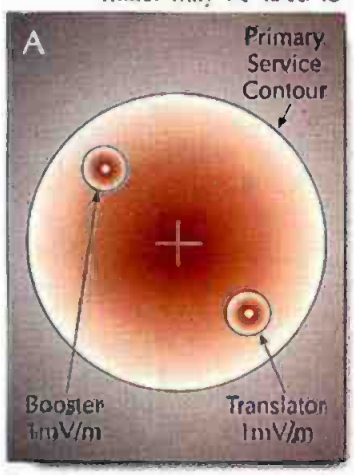
FM translators and boosters

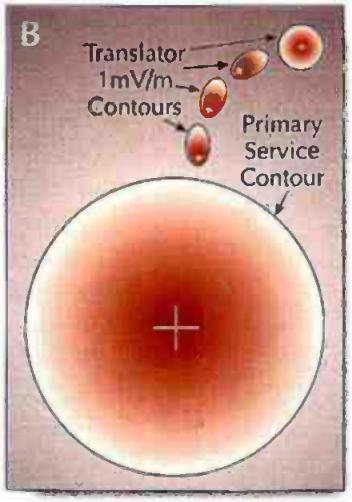
By John Battison, P.E., technical editor, RF

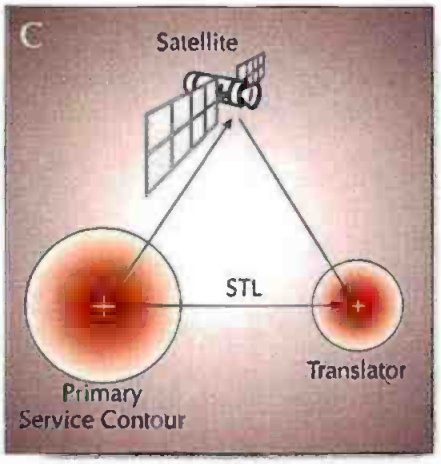
It used to be that all translators were low power, on the order of about 1W. Some time ago, the FCC raised the ante, and FM translators are now allowed to go as high as 250W. In some cases, they can go as high as 20 percent of the primary station's power.

AM boosters

AM boosters are actually synchronized transmitters. A synchronized on-channel AM transmitter may be used to fill in a poor reception area in an AM service area or to extend coverage from a primary station, provided no interference is caused outside of the mutual-interference area.







Translators and boosters can be installed within a station's primary service contour (a), extend beyond it in a daisy-chain (b) or with an STL or satellite link between sites (c).

The best example of this type of AM booster operation was the old WBZ/WBZA Boston/Springfield combination on 1030kHz. These were actually two transmitters with individual licenses but the same licensee, whose carriers were synchronized to reduce the interference area between them. More recently, improvements in technology have made this type of operation more feasible, and several AM stations use it today. Despite strong efforts to persuade the FCC to allow FM translators to be used to improve AM service areas, applications have been denied.

FM translators and boosters

An FM translator operates on a different frequency from its primary station and, depending on the circumstances, may be operated by the primary licensee or a separate group. Its service contour may extend beyond the primary station's service contour. Its purpose is to retransmit the primary stations' signal without modifying or changing it in any manner. FM translators do not add to the signal, with the exception of IDs and limited, tightly controlled local announcements.

On the other hand, an FM booster operates on the same channel as the main transmitter, and its service contour *must* fall within the service contour of the primary FM station. Its purpose is to fill in areas of poor service, and it is licensed to the primary FM station operator. Obviously, it carries the same program as the primary station and has a dual ID.

Operation of translators

Part 74, subpart L, of the *FCC Rules* governs the operation of FM translators and boosters. Let's have a look at the major considerations governing their use.

For commercial stations, a translator can operate in one of two ways. When used within the service contour of an FM station for fill-in purposes, a translator's coverage contour (1mV/m) must remain within the service contour of the primary station. The signals that it retransmits may be received directly through off-air or other means.

A translator is required in order for listeners outside the service contour of an FM station to receive service. However, this translator cannot be constructed by the licensee of the primary station. Nor may the licensee give any financial or engineering aid toward the translator's construction prior to its going on the air. After construction, a primary station licensee may provide technical support in maintenance or service to help the translator comply with the commission's rules.

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RF Engineering

Noncommercial FM stations follow an easier set of rules, and translators may be programmed by any suitable method of supplying the primary station's signal. Paragraph 74.1231(b) of the *FCC Rules* sets out the rather extensive set of conditions for noncommercial operation.

The relative ease with which such stations can employ translators has led many to carry stations far out of their local coverage area. Some West Coast NCE primary stations now have translators fed via satellite all across the U.S. This development has made nationwide FM coverage possible on a scale not permitted for commercial operators.

Class	Contour limit
B	0.5mV/m contour
B1	0.7mV/m contour
All others	1.0mV/m contour*
*including NCE stations.	

Table 1. The coverage contour limits for translators by station class.

FM translator requirements and coverage

Translator coverage contours are the same for translators as for the associated primary station. Table 1 shows the coverage limits. Commercial stations may use channels 221 to 300. NCE stations may use channels 201 to 300.

Of course, interference with any authorized stations is prohibited. This includes commercial, NCE, other translators and boosters as well as class D educational stations. Translators and boosters must also avoid interfering with channel 6 TV stations as primary stations.

Station identification for booster stations is determined by adding "FM" and the booster number after the call letters (e.g., WXXXFM-1). For translators, the FCC requires that aural IDs are made by the primary station at specific hours or hourly by Morse code. Translators of more than 1W TPO must provide station ID automatically unless they are identified by the primary station. FSK or tone modulation may be used.

Maximum effective radiated power (MERP) is determined by a combination of HAAT and ERP. There is a variation in the method for determining HAAT. Twelve radials replace the usual eight used to determine an FM station's HAAT. There is a qualifier in the procedure in that, for a non-DA translator, the MERP cannot exceed the lowest radial ERP.

The commission requires that the licensee have a copy of parts 0,1, 2,17, 73 and 74 of the *FCC Rules*.

Many NCE stations have found a tremendous listener base that was unavailable to them before the construction of translators. Some stations have made entirely low-power networks for regional or statewide coverage. Commercial stations have not made as much use of boosters and translators, primarily because of the more stringent rules that apply to them.

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

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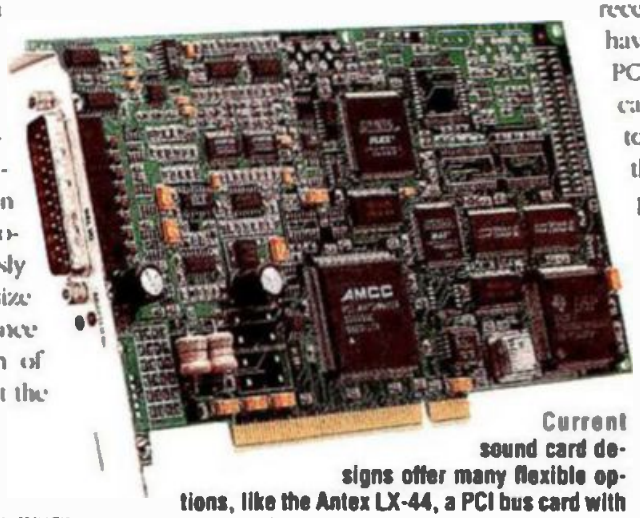
Circle (113) on Free Info Card

Sound cards change their tune

By Skip Pizzi, executive editor

When PCs first came into use in radio broadcast and production operations, CPUs were slow and storage was expensive. Back then, the sound card took care of A/D and D/A conversion of audio signals as well as conversion of the audio signal to and from the file format used for storage. These file formats were designed with storage efficiency in mind, so they often compromised fidelity to increase the capacity of hard drives. In more high-end cards, data compression algorithms were installed on additional DSP chips.

Today's computers have faster and more powerful CPUs. Hard-disk and RAM storage are plentiful and affordable. The computer's CPU can now handle much of the processing sound cards previously performed, and audio file size isn't as great a concern as it once was. As a result, the design of sound cards has evolved to fit the new computer environment.



Current sound card designs offer many flexible options, like the Antex LX-44, a PCI bus card with multiple inputs and outputs.

Multichannel designs

Although early sound cards were typically two-channel I/O devices (some featured four outputs at most), recent sound-card designs are usually multichannel units. Today, even inexpensive sound cards feature eight or more output channels. With the appropriate DAW or automation software, multiple audio outputs can be mapped to these sound cards, allowing a single computer to feed multiple inputs on an external mixer or, more commonly, to feed multiple, independent program streams at a consolidated broadcast facility.

This capability means that a single PC equipped with a multichannel sound card can drive automated programming for several stations or feed a station's air signal plus one or more separate online audio streams. For the latter, however, additional PCs may still be needed downstream for streaming media encoding of the online services connected to the multisource originating PC via a LAN or real-time audio paths. (For LANs, file size is still an issue. Therefore, many sound cards retain the ability to apply perceptual coding to audio signals or uncompressed files.)

A few sound-card manufacturers offer custom OEM work for more sophisticated broadcast systems, which will allow tighter integration of multistream services into a single platform. This is another departure from previous practice, in which an off-the-shelf, general-purpose design was the norm.

New form factors

Early ISA bus designs evolved into PCI cards, increasing the capability of sound cards to address the CPU at higher resolutions and with a greater number of channels. More recently, highly capable designs have been manufactured for PCMCIA cards as well. These cards are particularly welcome to radio reporters because they allow complete field production on laptop PCs.

More recently, the sound card has moved to a two-piece design, with an umbilical between the PCI or PCMCIA interface and an outboard box. The latter contains A/D and D/A converters and multiple, standard audio connectors of either balanced or unbalanced varieties (i.e., RCA, ¼-inch TS, TRS, XLR). Many cards also offer AES or SPDIF digital I/O. Besides logistical convenience and added connection reliability, these features contribute to lower noise floors, particularly because sensitive analog circuits were now outside of the high-RF environment found within the computer chassis.

Probably the latest trend in sound cards is a stand-alone device that acts as an audio I/O device on an Ethernet network (LAN or WAN). These devices connect directly to the network, generally at 10BaseT speeds, with no

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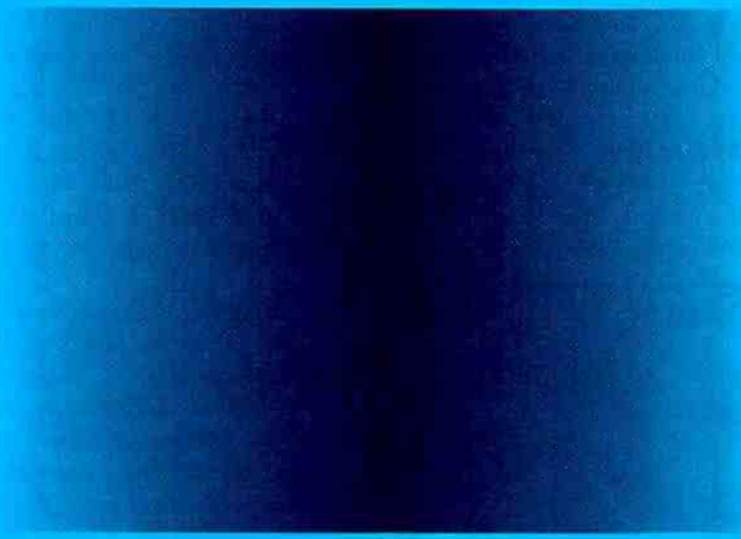

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need for a host PC. They are addressed as remote terminals by other PCs on the network and can be physically distributed wherever they are required for audio collection or delivery. The sound files they create are sent via the network to PCs or servers for storage and manipulation.

Properly configured, these embedded devices can accommodate dozens or even hundreds of channels of audio I/O. Remote machine control via RS-232, GPI or contact closures may also be included, along with DSP for rudimentary local audio processing. Typical applications include courtroom logging input, zoned or smart PA systems and home automation. Astute broadcast-systems designers may find applications for these devices around the radio facility as well.

Enhancements

Incremental advances continue to appear in many sound-card products, providing qualitative and quantitative improvements. To wit, 20-bit converters are now common, with 24-bit resolution and 96kHz sampling available on some of the most recent designs. The best of today's sound cards couple these high-resolution digital signals with audiophile-quality analog circuitry and board design, careful filtering, plus balanced I/O and extensive internal use of differential signal paths. This design provides a level of audio fidelity previously unattainable with PC sound cards.

Some newer sound cards also offer Dolby AC3 encoding onboard, allowing easy creation of 5.1-channel audio files for surround-sound programs. Other units include high-quality microphone or instrument inputs that allow direct connection to the PC without an intervening mixer.

Another recent advance is the integration of MIDI and synchronization ports on the sound card. This capability provides a measure of simplified control via a single user-interface. It also saves peripheral slots and their associated impact on the host PC and OS by allowing a single card to provide the functions previously performed by several. Such a card can allow audio production software running on its host PC to act as slave or master to a variety of other outboard devices as well as locking the computer to house word clock. When used as a master, these new cards tend to exhibit remarkably low jitter compared with earlier designs.

Would you like software with that?

All sound cards come with some software, but the user does not always understand the impact that this software will have on the card's performance. Most sound-card problems can be traced to the *drivers* — small data files that act as glue between the host platform's OS (and by extension, the audio application running in that environment) and the sound-card hardware. No matter how well the hardware is designed, without a reliable driver, it is destined to frequent failures — typically manifested

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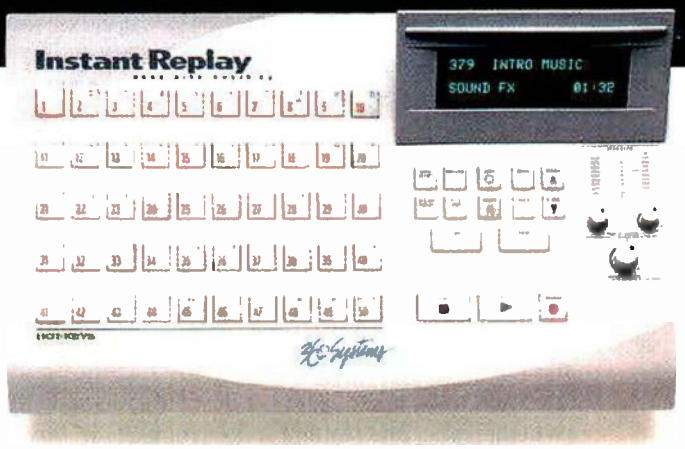

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as system crashes, lockups and painfully audible artifacts.

Nevertheless, no one likes to write drivers. Hardware designers are often uncomfortable doing so, and software writers look down their noses at such a menial task. Drivers are rarely credited as elegant solutions; they are the offensive line of the software stack. But without good (and up-to-date) drivers, all is lost. Keep this in mind as you peruse the sound-card marketplace or troubleshoot your current system.

The Digigram NCX200 exemplifies a new form factor for sound cards. The unit serves as a stand-alone audio terminal that connects directly to an Ethernet network.

Some sound cards also come with audio application software, ranging from shareware and utility bundles to full-blown multitrack editors. In some cases, this software can add significant value to your sound card and may eliminate the need for additional software purchases.

The range of available products in the sound-card market is wide and ever-growing. In many cases, a cheap solution is all that is required, as is the case with a monitor-only workstation. Nevertheless, for any point at which program audio enters or exits a computer or network, the sound card will be the limiting factor for the audio quality of the entire digital production/delivery system. This pivotal hardware choice is made more complicated by the addition of new form factors and the changes in fundamental design of sound cards. Clearly, this is not a decision to be taken lightly; it deserves adequate study.

Whether you are stuffing a PC yourself or buying a turnkey system from an automation vendor, be sure to check under the hood and verify that you're getting the audio performance you require from the system's sound cards.

FOR MORE INFORMATION
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Now for the first time, you can realize the full potential of the world's finest condenser microphones with an affordable compact mixer: Room ambiance so detailed you can practically hear the carpet pattern...high frequency resolution that defines cymbals, triangles and bells down to the molecular level... midrange that's as gentle and fluid as a warm bath...and tight, authoritative bass with intoxicatingly rich harmonic texture. In short, you can now achieve an aural panorama that's breathtakingly realistic, excitingly vivid and truly 3-dimensional.

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Main studio and public files rules revisited

By Harry Martin

The FCC has revised and clarified some of the main studio and public file rules that went into effect on October 30, 1998. The rules gave licensees flexibility in locating their main studios and required that licensees keep their public files at the main studio. The amendments most recently adopted clarify rules regarding the telephone accommodation rule and the content of public inspection files.

The accommodation rule. Previously, the accommodation rule required stations to make photocopies of documents in their public and political files available by mail upon telephone request. On reconsideration, the commission decided that the public file would be reasonably accessible if a station located its main studio and public file in its community of license. There is therefore no need for stations to accommodate telephone public file requests.

Only stations whose public files are located at a main studio outside of the community of license's city limits are required to provide the accommodation. The commission also ruled that radio stations are not required to make mailings outside the station's protected service contour (0.5mV/m for AM and 1mV/m for FM).

When asked for public file information, stations should describe the number of pages and time periods covered by a particular ownership report or application, or the types of applications maintained in the station's public file and the dates they were filed. Stations are encouraged to keep such information on their websites.

Political file. In a reversal, the commission concluded that stations are not required to honor telephone requests for mailing the contents of their political files. The commission reasoned that, because of the heavy volume of telephone requests that occur during an election season, daily mailings to candidates and others requesting contents from the political file can unduly disrupt a station's operations.

Public file contents. The commission clarified its requirements regarding the applications that must be maintained in the public inspection file. It stated that, although all types of applications are now required to be retained in the file, they need only be kept while they are pending before the commission. Applications granted pursuant to a waiver must be kept in the public file for the duration of the waiver's applicability.

Furthermore, the commission clarified its rules regarding the retention of e-mails from the public. To ensure that only those e-mails regarding the operation of the station are retained, the requirement is limited to those e-mails sent to a publicly advertised e-mail address or to station management. Personal e-mails to staff members are specifically excluded from the retention requirement.

Noncommercial educational stations. The commission affirmed that noncommercial educational stations must maintain lists of donors supporting specific programs. As the commission stated last year, the donor list requirement is tied to its sponsorship identification requirements under its rules and the Communications Act.

Main studio and public file waivers. The commission concluded that stations that were pursuant to a main studio or public file waiver, and are now in compliance with the rules, are relieved of the special obligations placed on them as a condition of granting the waiver. These obligations included regular visits to the community by station management, establishment of a citizens' advisory board to meet with station management, coverage of local events in programming, maintenance of the public file in the community, and the provision of toll-free telephone service to the community. Such stations are required to provide toll-free service and coverage of local issues to the extent the rules affecting all licensees require them to do so.

Casino gambling ruling

On June 14, the U.S. Supreme Court released a decision finding that the commission's ban on radio and TV advertisements of private casino gambling does not apply to stations in Louisiana (and presumably other states) where such gambling is legal. While it broadly criticized the ban on broadcast gambling ads, the opinion does not specifically address whether stations in all states where gambling is legal may commence running gambling ads. Indeed, the Department of Justice is reportedly reading the Supreme Court's decision narrowly. Thus, stations should defer action on this decision pending an announcement from the FCC.

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

Dateline

Radio stations in the following states and territories must file their biennial ownership reports on new FCC Form 323 on or before October 1: Alaska, Florida, Hawaii, Iowa, Missouri, Oregon, Washington, American Samoa, Guam, Mariana Islands, Puerto Rico and Virgin Islands.

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

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

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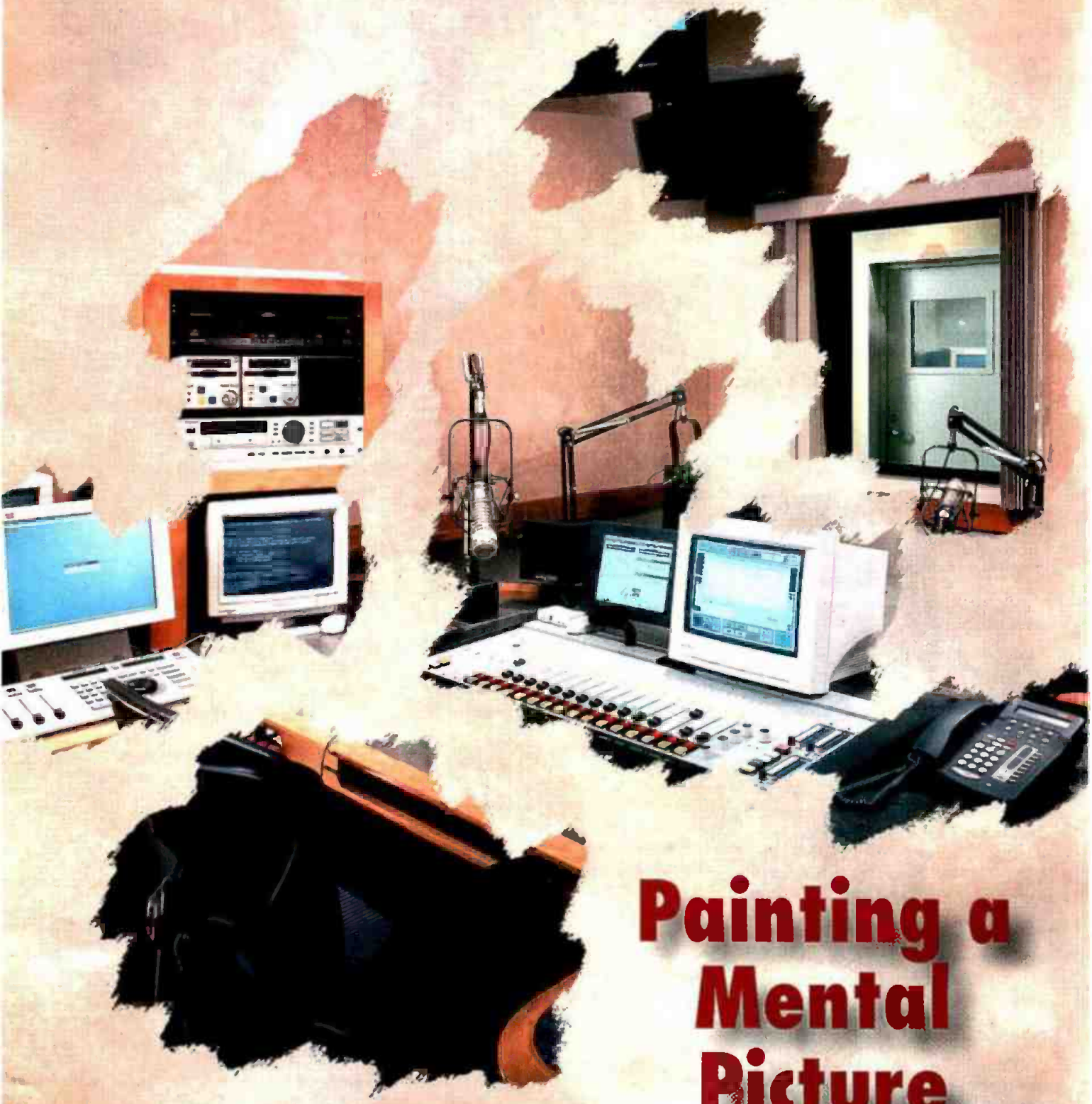
PRODUCTION



Painting a Mental Picture

Locally produced content will enhance a station's image.

Mix the right elements to compose your sonic canvas.

By Chriss Scherer, editor

In most radio facilities, production refers to any element that is prepared before the program goes live on-air. Production elements may be as simple as recording a 10-second announcement or as involved as recording audio off-site, then combining multiple elements to create the final program. Either way, there are a variety of tools and methods available for developing the produced elements of your programming.

Production studio design

Although the creative element is still important to good radio production, many facilities feel the pressure of time in the production process. A producer may only be able to devote an hour to one project before moving to the next. A control room with a simple and flexible layout will maximize the time spent on a project. Some facilities use larger setups with multiple effects and recording and playback sources. The primary function of a studio should determine its design. Studios designed for longer programming segments like feature shows will have a different design philosophy than those for creating spots and promos.

In the classic production studio, a console is the focus of the room. This setup is still commonplace. Surrounding the console are audio recorders/players and, frequently, some type of editor. Reel-to-reel tape machines are still used regularly in many facilities. If space allows, a separate voice booth is used in the production control room.

Commonly, the production control room will serve as a backup control room. Having redundancy of any kind in a facility is always wise, but today's production tools do not always fit the layout suitable for on-air use. Most radio production is no longer simple stereo recording. Starting the CD player and reading a script directly into the on-air playback system rarely leads to quality results. Radio production should enhance the sound of a station: The sound and image of the station should not be cast aside during a commercial break. The production studio should be a multicolored palette, and the studio should allow for creativity rather than constraining it. A successful production studio design will consider its primary function first.

Just as the announcers and program director are consulted for the design of the air studio, the production director and producers should be consulted for their views on the production studio. Most likely, the production director will not want to design the studio like an on-air control room.

The primary room function should dictate its design. In this facility, the main production studio (above) is a sit-down, multitrack console. The secondary studio is a stand-up operation and backup control room.

Recording and recorders

The two-track reel-to-reel recorder has played a major part in radio. Though they still see some use, new facilities are no longer installing them by the truckload. Open reel is still a viable format for limited distribution. The media is inexpensive and stores well for several years. Analog can also be more forgiving than digital. A slight misalignment of a player can easily be corrected. Analog tape can also be quickly edited.

If you are storing tape for any period, follow the manufacturer's storage guidelines for that type of tape. Temperature and humidity are critical variables. Proper tape storage will ensure that your archived recordings last a long time.

For digital recording, there are many options to consider. The first is format. For field recording, formats include mini-disc, DAT, RAM card recorders and laptop PCs with hardware/software interfaces. Retrieving the recorded audio from these devices can sometime be done as a digital file transfer. In some cases, an analog conversion step may be needed. Some of the field recorders can perform basic editing functions, too. It may be limited, but this editing capability can save time in the studio.

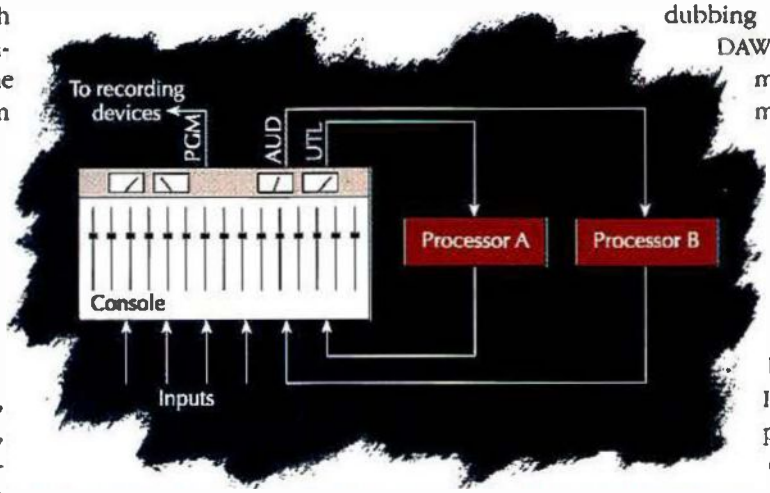


Figure 1. Effects routing can be done using additional mix buses and effects sends connected directly to processors.

In the studio, recorder choices vary more widely. Several devices are direct replacements for analog reel and cart machines. These stereo recorders are often small enough to allow more than one to be installed in a studio. In the case of a studio transitioning to digital slowly, several recorders may have been installed to replace a piece of aging equipment.

The latest evolution in radio production occurred with the introduction of the digital audio workstation. DAWs have fundamentally changed the production process. Multitrack recording has been around for some time (thank you, Les Paul). Editing multitrack tape was short of impossible and, when it was done, it affected *all* of the audio tracks. Editing just a single track was an acrobatic feat of dubbing and resynchronizing. DAWs have made managing multiple audio tracks much simpler.

More on DAWs

How many tracks do you need? Depending on the system you choose, the number of tracks may be fixed or unlimited. In most spot and promo production applications, eight tracks are usually the average needed. Music and feature-length productions may require more tracks. Some systems have the ability to record many tracks but play back fewer (sometimes referred to as virtual tracks). These systems have unique applications in radio, since commercials sometimes

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will be recut over the flight of the spot. The music and effects can all be put in their proper places, and three or more different reads can be mixed with it to cover a changing period of time. For example, a store sale or movie showing may have different scripts that specify "starting next week," "starting tomorrow," "starting today" or "running through the end of the month" all in the same piece. For mixdown, only the appropriate script is played. The other tracks are saved for subsequent versions.

Editing a production on a DAW is much easier than with multitrack tape. Any producer can tell you a story about an account executive coming in to hear a finished production only to make a comment that a single word needs to be removed. In analog multitrack tape days, such a change would wreak havoc. With DAWs, editing a single track is easy. After the edit is finished, many editors will even allow you to time stretch or squeeze the edited track into a specific time window, making the final product sound as if were planned that way all along.

DAW user interfaces use either dedicated controllers that mimic other familiar devices or a standard PC keyboard and mouse. Some producers may be comfortable using a mouse or trackball to scrub audio and mark edit points. Others may want the feel of a conventional mixer and scrub wheel. Be sure the system you choose is conducive to the people using it. The dedicated controllers may cost more but may also be easier to adapt to and find greater acceptance with the staff. As with any critical equipment purchase, arrange for as many demonstrations as you can. Creativity seldom flows in an uncomfortable environment, so you'll probably need several demos before you get a true feel for the equipment.

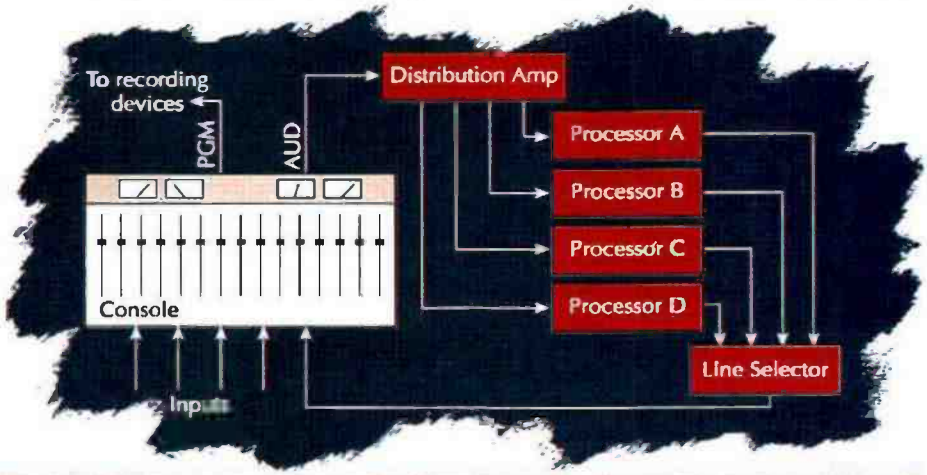

Figure 2. If there are more processors than there are sends, a line selector can be used to route the outputs of the audio effects.

Elegant Analog

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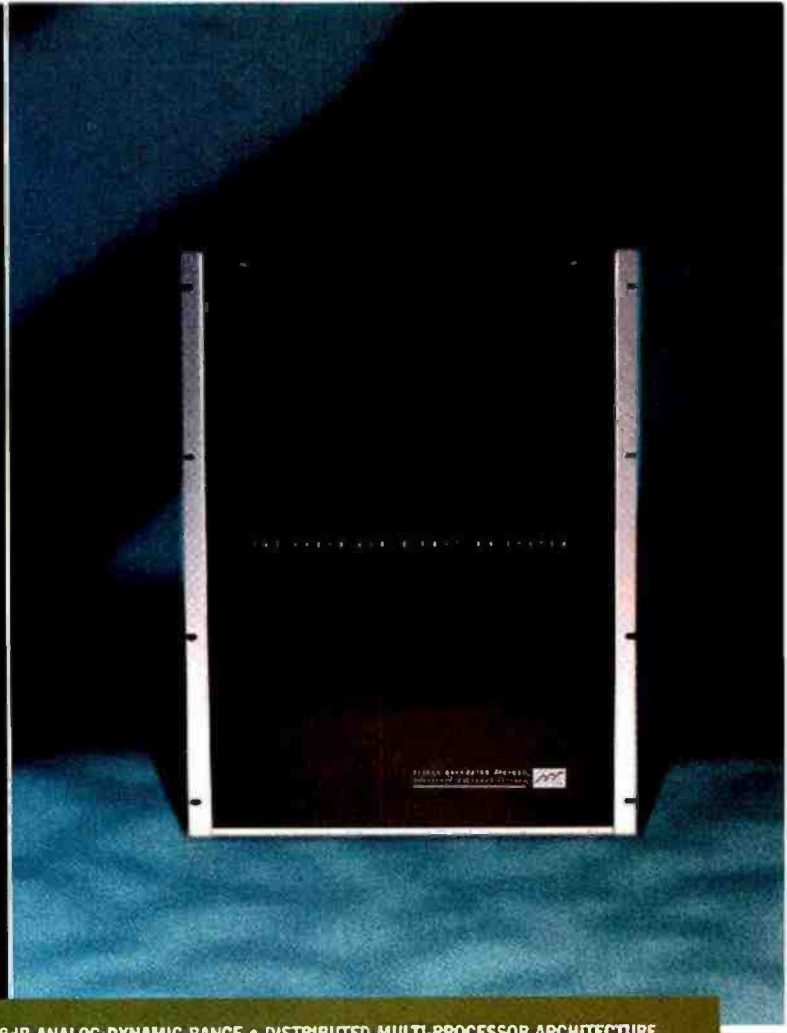

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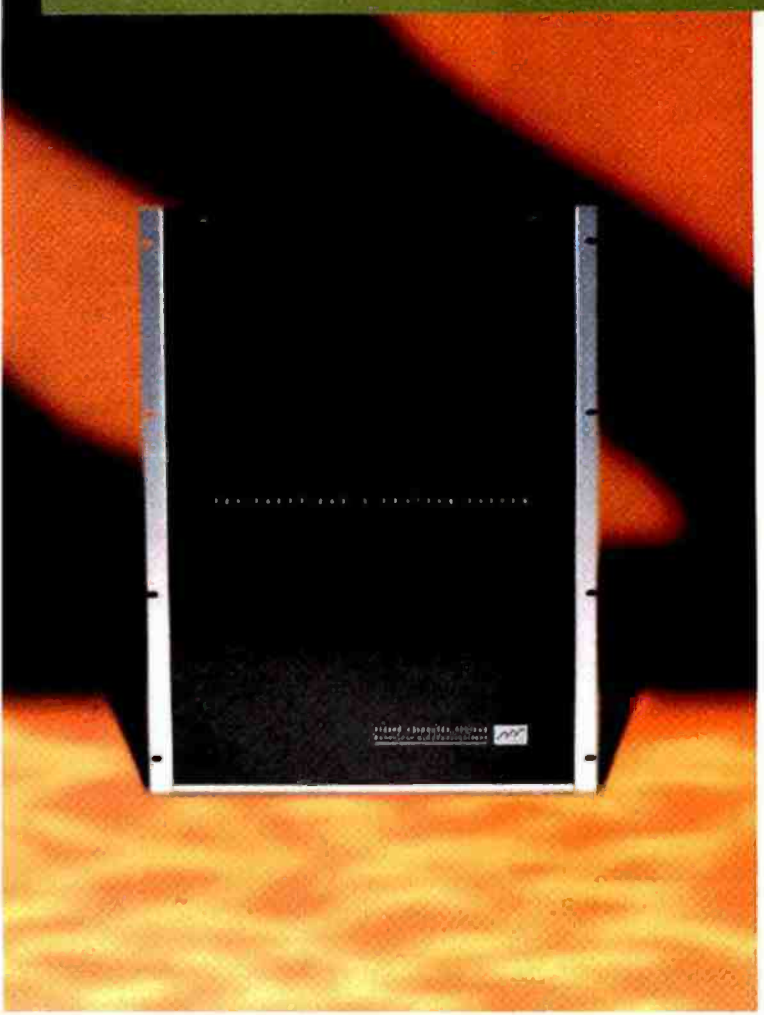

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PRODUCTION

From editing to on-air

Once finished, a production has to be made available for on-air playback. For longer programs, this may entail a mixdown to DAT or CD. If the on-air playback system has sufficient storage space, the program can be loaded directly into it.

Transferring a finished production from a DAW to the on-air system is a concern for many stations. If the two systems cannot directly communicate, you may need to play the final work in real time and record it into the on-air system in much the same way as dubbing to analog cart. It makes more sense to feed the digital production into the on-air system in a more direct fashion in less time while retaining any identification information (e.g., title, creator, run dates). Most DAWs and on-air systems can at the very least transfer a .wav or a .bwf file. Some manufacturers have also offered ideas for standards to be adopted among all manufacturers. These standards would make the transfer process completely seamless (see the accompanying story on the cart chunk proposal).

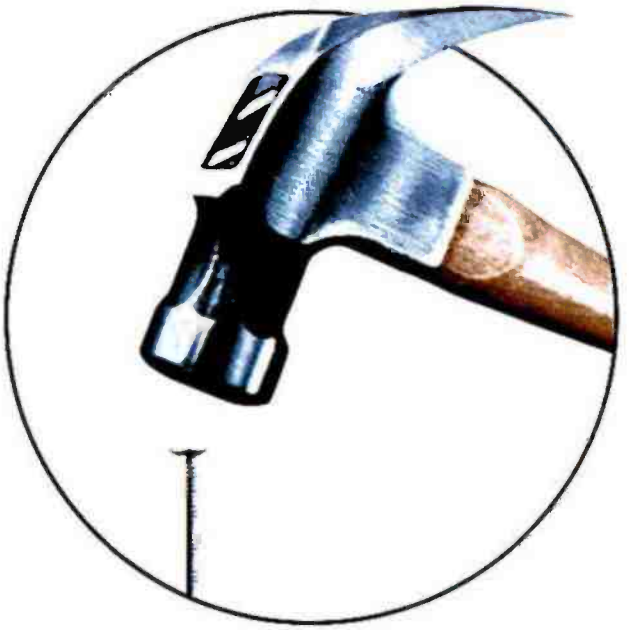
Some on-air playback systems have built-in or optional editors. Equipment from a common manufacturer will naturally have its own transparent interface. Some manufacturers have also worked together to provide interfaces between their brands of equipment. In some cases, this interface is an on-screen emulation of the on-air system from the DAW.

With any digitally based system, electrical power is a concern. Be sure to have any critical equipment on a UPS. Even a small UPS can prevent a disaster by allowing an orderly save and shutdown in the event of a power failure.

Having an effect

Routing signals within a station is not limited to analog audio. Digital audio and control are also seeing more distributed uses. In production, many of the same routing considerations for on-air use apply to getting sources into the studio. One unique routing application, however, concerns equipment within the studio.

When you need to nail the sound



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PRODUCTION

The home recording and project studio markets have made DSP-based effects processors popular. Some of the budget-priced equipment may not have specifications worthy of your air chain but may be suitable for production use, especially for reverb effects in which the output of the processor is added at a considerably lower level than the original signal. Be sure to match gain structures with any consumer or semipro equipment to the high-level, balanced equipment already in use. This is especially important if longer cable runs are used.

There are many methods of routing effects processors. One of the simplest is feeding the processor directly from the console audition bus or auxiliary send and the output of the processor into a channel input or effects return (see Figure 1). This method gives little flexibility but may work well if there are not many outboard boxes.

Figure 2 shows another approach that works well with multiple processors and few effects sends. In this example, only one effects send and return is used. The processors are all fed the same signal. The line selector determines which output is heard. Some electronic line switchers also have the capability to mix inputs. Depending on the effect used, this may offer additional flexibility.

For ultimate flexibility, patch bays are still the most cost-effective way to go (see Figure 3). One trade-off is that installation can take time. The advantage is that any

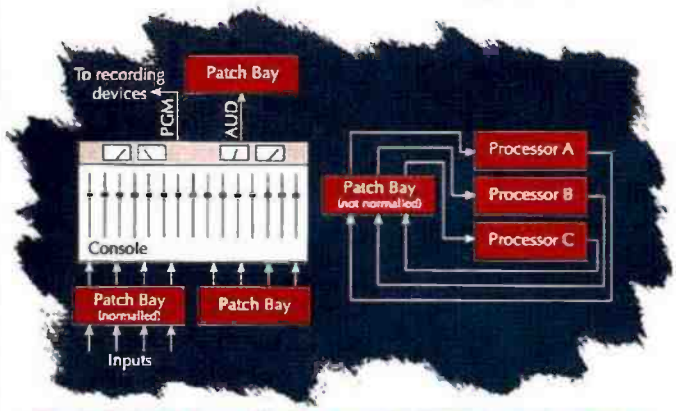


Figure 3. Patch bays offer the most flexibility in audio routing. Effects can be cascaded if desired. Channel insert points can also be used for more flexibility.

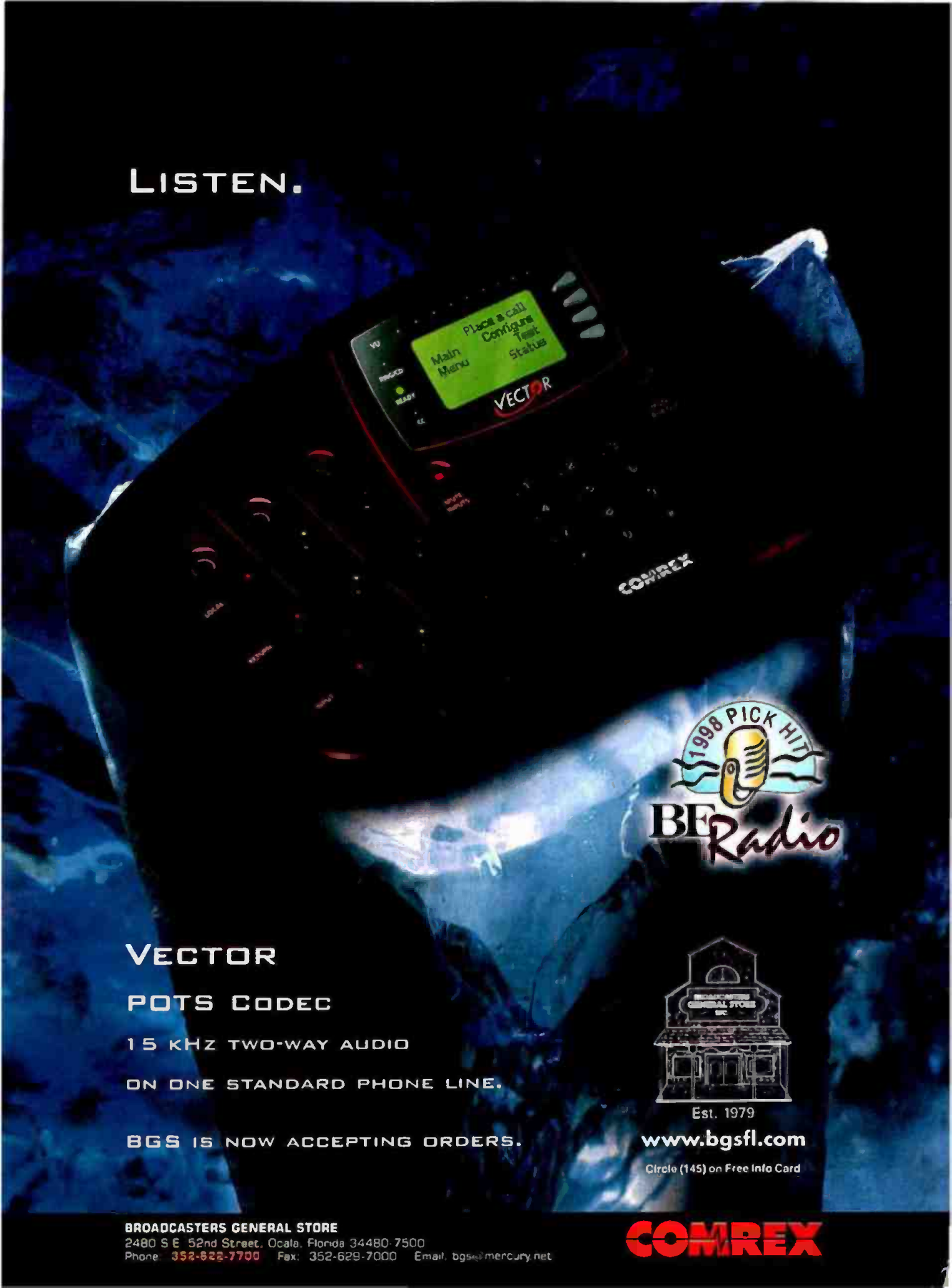
source or input can be connected to any other input or source. You can also make some patch bay to XLR (or other connector) cables for last-minute connections of the processor of the day that is being road tested.

Some DAWs have send and return capability built-in. In Figures 1, 2 and 3, the DAW can substitute the console connections.

Listen up!

Although air studios are not always designed as proper listening environments, production studios should be. Production should be a quality-control checkpoint. With DAWs, this may be a slight challenge.

Depending on the usage of the studio, the producer may sit at the console or the DAW during mixdown. The primary listening position should be set up in the position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used most often. It may seem strange to position the monitors around the DAW, but the producers will accept the configuration after sitting in it for a short time.

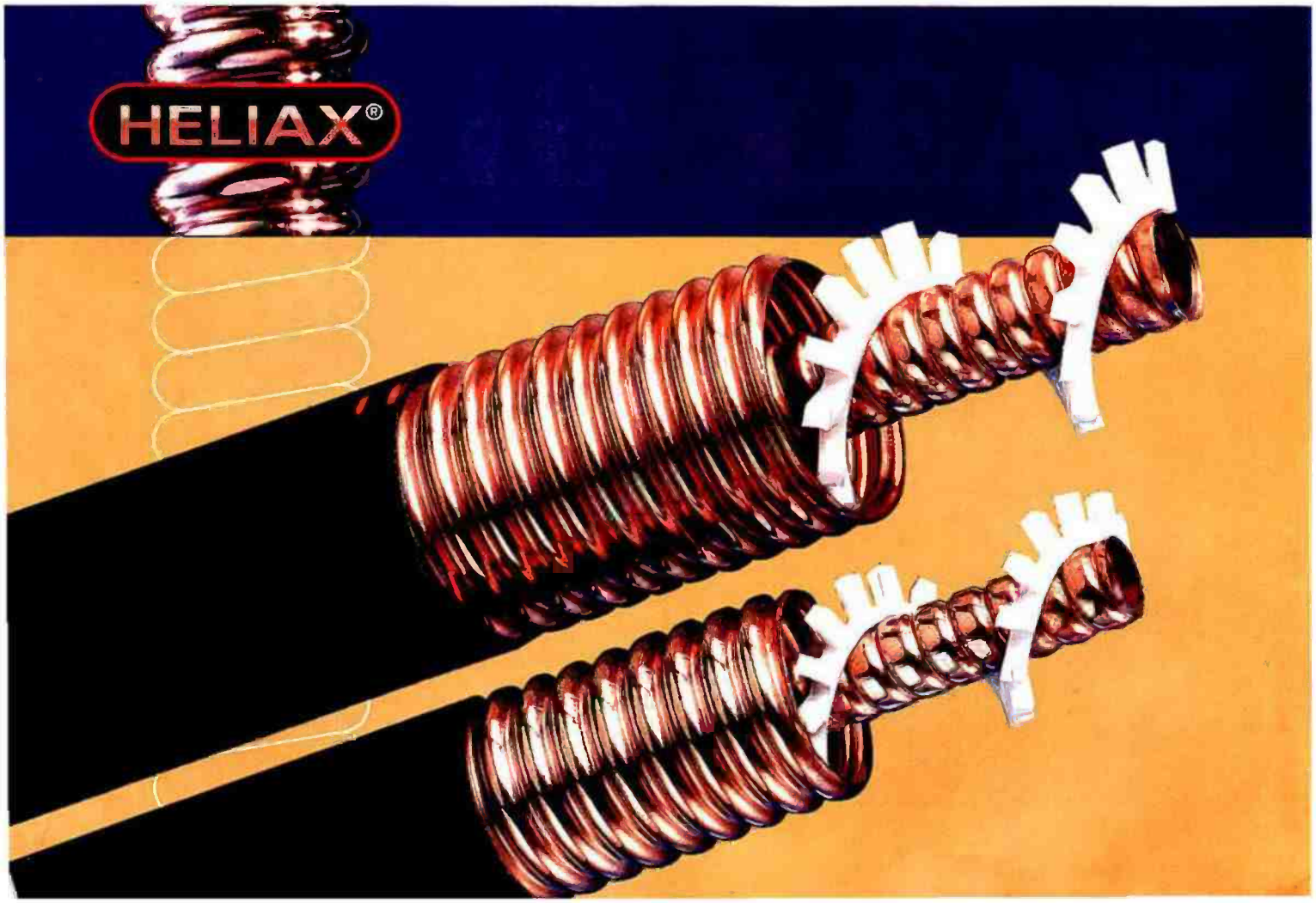
It may be necessary to install a secondary monitoring position around the other position. The second set of monitors may also serve as an alternate set of monitors for the first position. For example, if far-field monitors are used around the DAW, use near-fields over the console. The alternate monitor choice will help identify any audio problems.

If possible, allow for some method of checking stereo phase. A mono select on the monitors is a simple setup. You may be able to install a phase monitor display as well. Some smaller units now available can be installed in tight locations, including a meter bridge. Whatever method you choose, be sure the producers know how to use it and how to correct any problems that are encountered.

Off-axis monitoring does not allow producers to accurately hear everything. A second monitoring system may be needed.

In situations where a separate voice-over booth is used, additional monitoring must be in place. Clear and simple communication between the announcer and the board operator is important. Many consoles offer some type of talkback circuitry that can be used or modified to your basic needs. For more elaborate communication, or if multiple studios are tied together, a dedicated system may be needed.

Creating content and the artistry that goes along with it requires talented producers. You can't force someone to be creative, but you can provide a suitable environment in which to create the next masterpiece.



A bridge between systems: The cart chunk proposal

By Dick Pierce and Geoff Steadman

The last decade has witnessed tremendous growth in the use of technology in radio applications. The use of digital audio editing workstations for radio production is common, and on-air delivery and automation systems are widely accepted. Users continue to wonder when all these systems will actually work together; there seem to be as many file formats available as there are system vendors.

Cross-platform links have been made to connect specific production workstations to specific on-air systems, generally as strategic alliances between vendors. Although such links can work well, they can be expensive to engineer and implement and inflexible because of their dependence on proprietary database and audio formats. Problems with synchronizing engineering teams across company borders are compounded by compatibility problems that may arise as a result of software revisions.

Most on-air delivery systems use common traffic and continuity data to describe a piece of audio, including title, start and end dates, timer markers, cues, cut numbers and other elements. Meanwhile, as audio becomes increasingly file based, the WAVE format has become a de facto standard for audio file interchange.

The WAVE format has extendibility through the use of *chunks* (self-contained packets of data within a .wav file). Orban has coupled this with the commonality of traffic data to propose a new chunk which allows the on-air information to ride along with the audio (in effect, a digital cart label). Dubbed the *cart chunk* and modeled after the EBU's Broadcast Wave File, the contents and format of this new data type were derived from a variety of industry applications and lengthy discussions with many users and vendors.

Rather than further propagate the problems associated with proprietary data formats, the decision was made to go public and submit a standards proposal to the European Broadcast Union and Audio Engineering Society. This opens up the definition process to industry participants for the benefit of all, without allowing any single participant to control it for a competitive advantage. The seed has been planted, and the process and outcome belong to the radio industry, to users and vendors alike.

The goal of the proposal is that the cart chunk will substantially reduce the burden of integrating diverse radio applications by acting as an interchange protocol between systems. A finished production with the cart-chunk information could be distributed to multiple on-air systems, and each one would automatically insert the information in its database.

With the continuity information already attached, the on-air system merely translates it into a form suitable for its own internal representation and incorporates it into its own native database. Carrying the information around as an integral part of the audio itself means that finished productions can be shared among various on-air systems, even those from different vendors.

The concept is fairly simple and the technology already exists to develop this type of open standard. The intent is to benefit the broadcasting industry by introducing a common standard.

The current cart chunk proposal can be viewed at www.orban.com/orban/techforum/audicy/pages/nab_cart/1999NabCart.pdf.

Dick Pierce is senior software developer, Audicy. Geoff Steadman is product manager, editing systems, for Orban, San Leandro, CA.


1999 SALARY SURVEY
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ARE YOU ON TARGET?

By Dana Martin, associate editor

Find out if you make what you're worth. The 1999 BE Radio Salary Survey will help you see if your earnings hit the mark.

Many people derive satisfaction from doing their jobs well, from possessing specialized skills that are invaluable to the companies they work for. As an engineer, you're bound to feel a sense of pride when you successfully complete an air studio or even when you carry out an everyday task, like aligning a CD player. Nevertheless, you also want to see your value reflected in your paycheck, and the *BE Radio 1999 Salary Survey* will help you determine where you stand in relation to your peers.

The survey is designed to determine salary levels among *BE Radio* readers for select title groups, to examine salary trends, and to consider broadcast salaries as they relate to SBE certification. This year's survey also includes feedback on how to minimize the exodus from the field of radio broadcasting; respondents were asked for input on how to retain existing engineers and attract new talent to the field.

Cover letters and questionnaires were sent to 1,168 *BE Radio* subscribers selected on an *n*th name basis among radio station and network subscribers. Of these, 394 usable surveys were returned, for a response rate of 34 percent.

The survey targeted three groups: station management, staff engineers and contract engineers. For analysis, each of these groups was broken down into the MSA rank groups Top 50 and Below Top 50. Response subcategories are delineated as follows: 105 station managers (44 Top 50, 61 Below Top 50); 165 staff engineers (81 Top 50, 84 Below Top 50); and 124 contract engineers (38 Top 50, 86 Below Top 50). For station management, specific job titles include general manager, station manager, vice president of operations, operations manager/director, program director, production manager and news director. For the staff engineering category, specific job titles include vice president of engineering/corporate director of engineering, chief engineer/market director of engineering and technical director/manager.

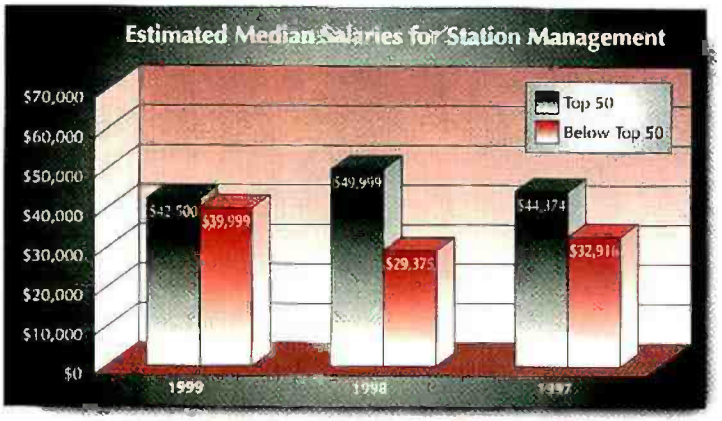
The information gathered in this survey is intended to illustrate broad trends in the radio industry and is not meant to be used as the sole source for determining salaries. Rather, the data should be treated as a starting point for salary ranges. Factors such as the cost of living in a specific region and the demand for a particular job are also important in determining the salary range for a position.

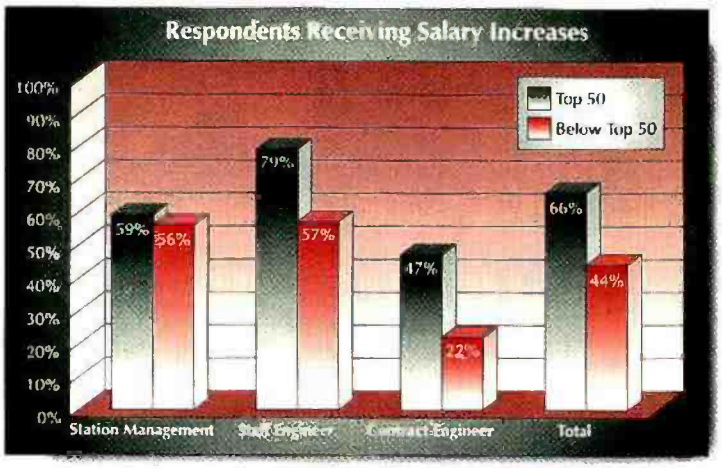
Increases

Most engineers received a salary increase in the 12 months prior to the survey, especially those in the Top 50 market. Fifty-nine percent of station managers, 79 percent of staff engineers and 47 percent of contract engineers in this market received salary increases. Station managers in the Below Top 50 market fared almost as well as their Top 50 counterparts, with 56 percent receiving increases. Staff engineers and contract engineers in the Below Top 50 markets fared substantially worse than their Top 50 peers. About three of every five staff engineers (57 percent) received increases. Contract engineers in this market fared the worst. Just over one in five (22 percent) was fortunate enough to see an increase. This abysmal statistic, however, cannot be

blamed wholly on the radio industry because most of the contract engineering respondents do not earn all of their money from radio broadcasting work. (Nearly 40 percent earn less than half of their income from radio broadcasting, compared with only 18 percent who receive 100 percent of their compensation from such employment.)

Overall, 66 percent of respondents in the Top 50 market received increases, compared with only 44 percent of those in the Below Top 50 market. Station managers and staff engineers in the Below Top 50 market who received raises had a median increase of 5 percent, 1 percent more than their peers in the Top 50 market. And those contract engineers who got raises got the healthiest raises of all. The median increase for those in the Top 50 market was 7.5 percent, compared with a respectable 5 percent in the Below Top 50 market. Across the board, the median increase was 5 percent.





Salaries on the rise, mostly

Salaries for station management in the Below Top 50 market increased by 36 percent from $29,375 in 1998 to $39,999 in 1999. In the Top 50 market, the median salary dropped to $42,500, down 15 percent from $49,999 in 1998 and down 4.2 percent from $44,374 in 1997.

Both Top 50 market and Below Top 50 market staff engineers continue to receive increases in median salaries. Median salaries for staff engineers in the Below Top 50 market increased 14 percent, to $42,500. Top 50 market staff engineers had an increase in median salary of 6 percent from last year, to $59,444.

In the Top 50 market, salaries for contract engineers have increased for the past three years. Their compensation rose 33 percent since 1998, to $46,667. Though they experienced a salary increase of 21 percent from 1997 to 1998, contractors in the Below Top 50 market saw declines in 1999. Their median salary dropped by 13 percent to $37,000.

Certification

The number of SBE Certified engineers has continued to drop over the last three years, from 41 percent in 1997 to 36 percent in 1998, to 34 percent in 1999. There is still, however, an incentive for obtaining SBE certification: In general, those who are certified receive a higher salary than those who are not. For staff engineers, this trend has been consistent over the last three years. In 1997, certified engineers earned approximately 4.7 percent more than non-certified engineers. In 1998, the gap narrowed a bit to approximately 3.5 percent. This year's results show an even greater margin between those with and without certification: Certified staff engineers earn a median salary of $59,999, compared with $47,500 for non-certified staff engineers, or a difference of approximately 21 percent.

In contrast, the numbers pan out differently for contract engineers: Those without certification earn a median salary of $42,150, compared with $37,500 for those with SBE Certification. Perhaps this income disparity reflects the fact that, for contract engineers, certification is not the primary criteria used in a contractor's selection. Contract engineers

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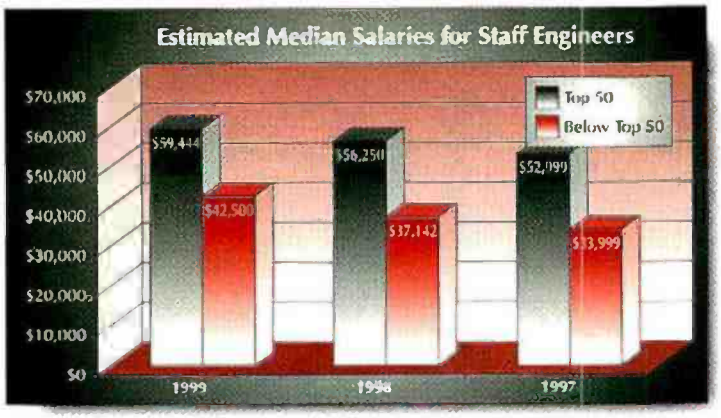
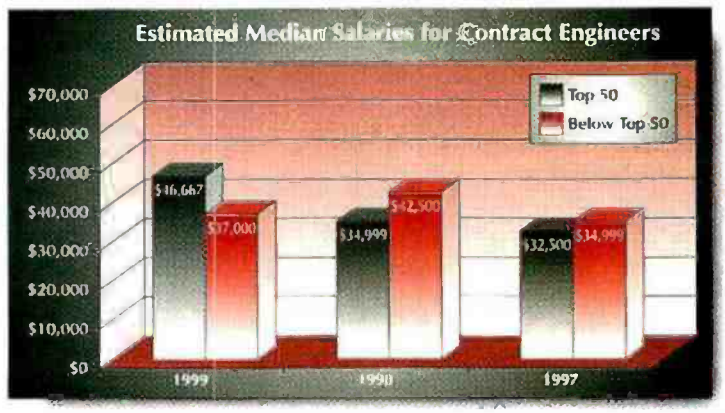


are frequently hired to fill a staffing shortage or complete a short-term project, and they are often needed in a pinch. In these cases, availability and experience may weigh more heavily in the hiring decision than does accreditation.

It would be premature to label this apparent reversal as a true salary trend, considering this is the first time, in the last three years, that non-certified contract engineers have made more than their certified counterparts. In 1997, the median salary for certified contract engineers was equal to that of the non-certified engineers and, in 1998, certified contract engineers earned approximately 18 percent more than those without certification. Furthermore, it is difficult to quantify the compensation of contractors, because their income is often supplemented by sources other than radio broadcasting. In this light, it is difficult to assess whether certification is a limiting factor in the contractor's compensation.



Retaining staff

With the number of high-tech positions on the rise, it is harder than ever to retain existing technical staff at radio stations, let alone bring new professionals into the fray. Our respondents offered their insights on how to keep technicians around as well as attract new employees to the field. The first and perhaps most obvious solution is to offer more competitive salaries. Respondents feel that their salaries must be on par with other technical fields, including computing

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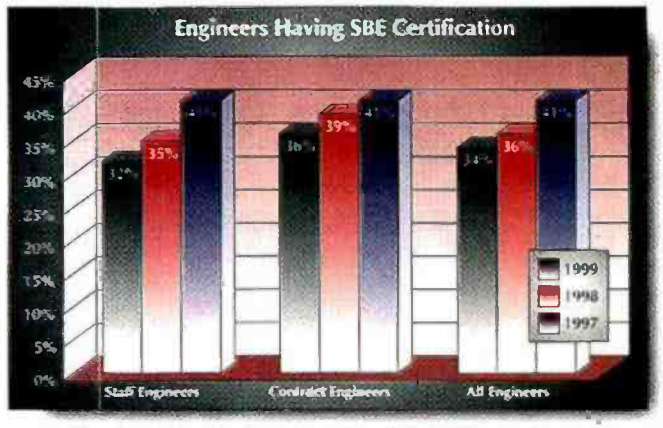
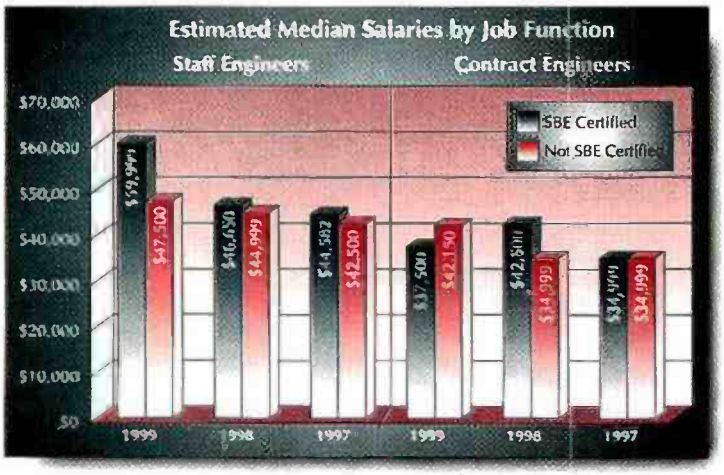
and telecommunications. Such fields require about the same amount of training, yet easily outmatch the broadcasting industry in terms of pay and benefits.

Other considerations include treating engineers as professionals, offering more education and training to help them keep up with the growing and ever-changing demands of broadcasting, and improving the work environment and overall attractiveness of the field.





Respondents point out that the hours and responsibilities of the job are often deterrents to entering the field, especially if compensation does not reflect these job demands. Furthermore, especially with consolidation, some engineers feel they are expected to produce greater results with fewer resources. These engineers would like to have sufficient staff and tools to complete projects smoothly without being overtaxed. To attract young people to the field, respondents indicate that more high school and college recruiting programs should be created.

Though this year's survey results reflect another year of growth and prosperity, the individual voices in our crowd indicate that the industry must still overcome substantial hurdles. Each year's results help to establish a baseline for future developments. Nevertheless, with consolidation on the rise and other variables in tow, the long-term growth of the industry remains to be seen.

Editor's note: The complete results of the BE Radio 1999 Salary Survey *are available for $50 each. Contact Matt Muckerman at (913) 967-1946 or e-mail beradio@intertec.com for more information.*

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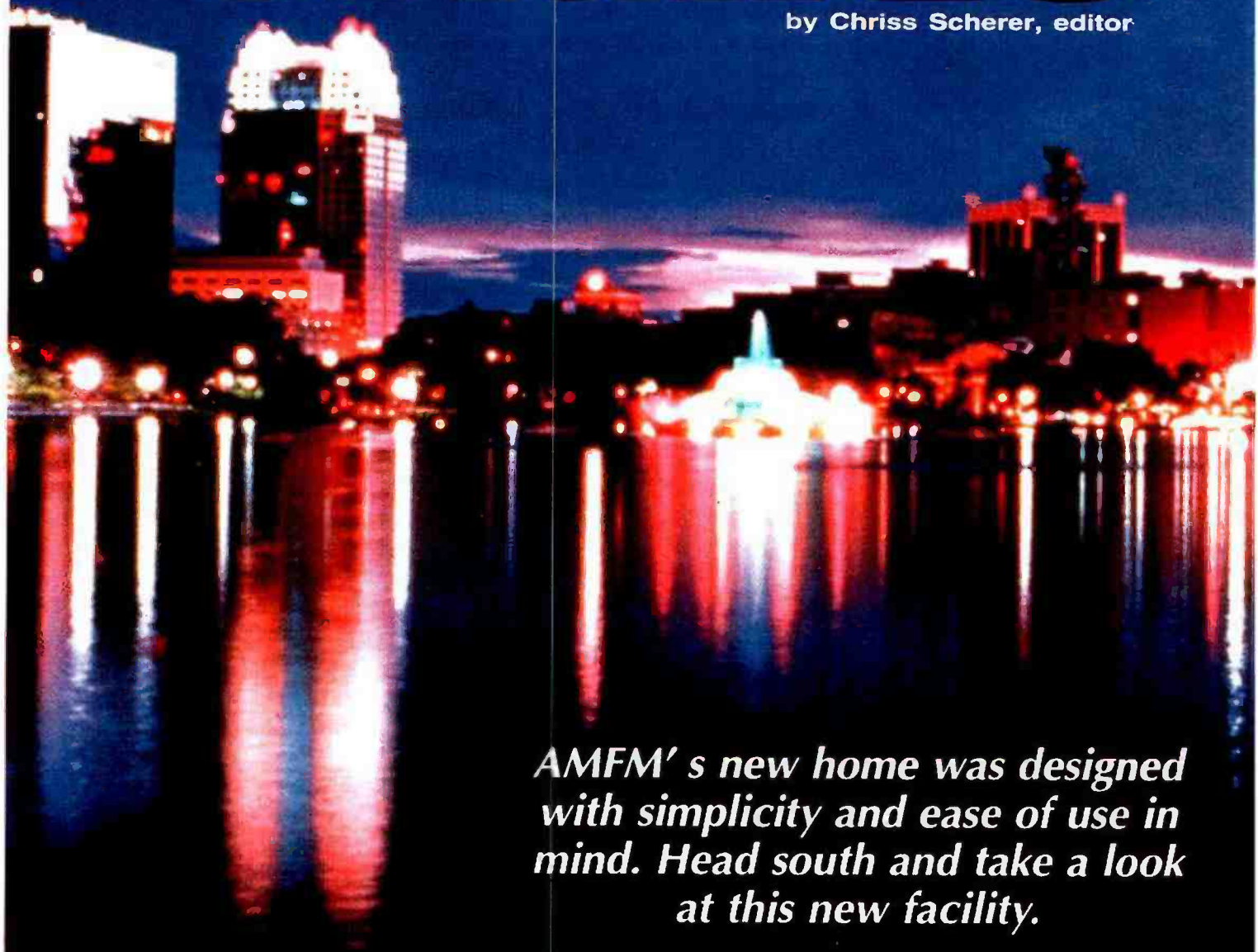
FACILITY SHOWCASE

AMFM of Orlando

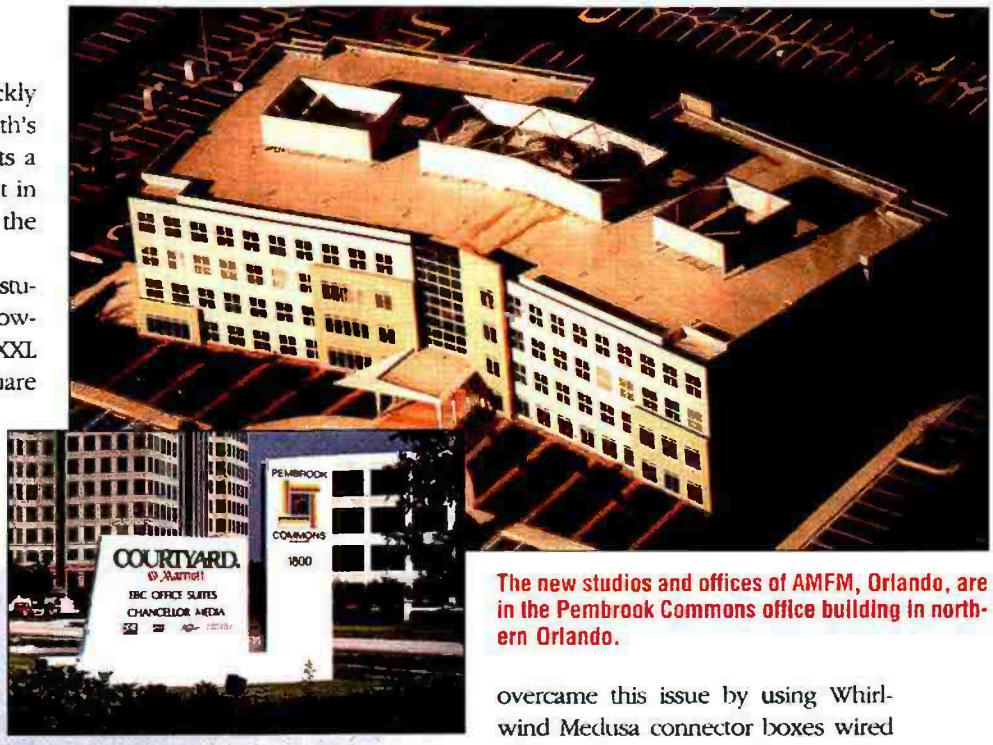
by Chriss Scherer, editor



AMFM's new home was designed with simplicity and ease of use in mind. Head south and take a look at this new facility.

The NAB Radio show is quickly approaching, and this month's facility showcase highlights a recently completed facility project in Orlando, the city that will host the upcoming event.

Owned by AMFM Inc., the new studios for WJHM (102Jamz), WOCL (Power105.9), WOMX (Mix105.1) and WXXL (XL106.7) occupy nearly 29,000 square feet in the Pembrook Commons office building in northern Orlando. The studios overcame common pitfalls by employing the right mix of cutting-edge technology and a sound design sense. The plan called for redundancy and flexibility above inessential creativity.



The new studios and offices of AMFM, Orlando, are in the Pembrook Commons office building in northern Orlando.

With only a nine-month span between initial construction and project completion, the facility planners had to maintain a tight schedule. The project began in October 1998, and studio construction commenced the following January. The stations moved in on a staggered schedule between April and June of 1999 to ease the burden of four major station moves.

Studio specs

The overall plan is simple and uniform. Each station contains three studios: a control room, production room one and production room two. The general design for the rooms is similar, including the equipment installed in each. For each station, production room one also serves as a backup control room. All of the studios are designed for stand-up operation, with the exception of production room two for WXXL and WHJM, both of which are sit-down operations.

At the center of each control room is a Pacific Research and Engineering Radiomixer. Other equipment common to all of the control rooms includes the following: Denon DN951-FA CD players, JBL monitors, Panasonic SV-3800 and SV-4100 DATs, a 360 Systems Instant Replay and ShortCut, a Rane MLM-82 eight-channel mixer, a Telos 1A2 interface with dual Delta 100 hybrids, Electro-Voice RE-20, RE-27 or Shure SM7 microphones and an ENCO DADPRO32 terminal. Currently, only commercials and promos are stored on the DADPRO32; all music is played from CD. An additional computer, with Internet and LAN access, handles call screening with Telos Assistant Producer software.

In most of the studios, Electro-Voice RE-20 microphones are used. The exceptions are WOCL's control room, which employs Electro-Voice RE-27s, and the WJHM studios, which use Shure SM7s.

One problem many control rooms encounter is handling itinerant audio sources and feeds, such as live bands and TV crews. The AMFM facility overcame this issue by using Whirlwind Medusa connector boxes wired to a Rane MLM-82 mixer. The mixer is only 1RU, so it doesn't get in the way, and the connector box can be stowed when not in use. Further, it has mono program outputs to supply TV crews with an audio feed.

One of the design goals for planners of this facility was to standardize all of the equipment used in the studios. Standardizing equipment affords an additional level of redundancy. This goal was realized in the control rooms.

The front lobby welcomes visitors to the new facility.

FACILITY SHOWCASE

In the production rooms, however, the designers chose to transplant some equipment from their previous studios. Though this meant full redundancy would be compromised, the retrofitted equipment still had longevity, and it can eventually be replaced with standardized equipment.

The digital audio workstations are an example of a mixed bag of equipment. WOMX uses Orban editors (a DSE7000 in production room one and an Audicy in production room two). The WOCL and WXXL production studios use Sadies, as does WJHM's production room two. WJHM production room one uses a SAW.

The control room for WOCL (Power105.9).

Production room one for WOCL has the only Productionmixer in the facility.

Each station's first production room serves as a backup control room and a Radiomixer has been installed, with the exception of WOCL, which uses a Productionmixer. For each station, the second production studio is built around a Yamaha O2R rather than a production console. These production rooms also incorporate DGS and DCI audio-receive terminals. The long-term plan is to make the transition to completely digital facilities. The O2R is one step in that direction. Digital connections are only used when available, rather than forcing equipment to be digital right away.

Besides the use of standardized equipment and wiring, the designers also decided to stay away from

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Production room one for WOMX.

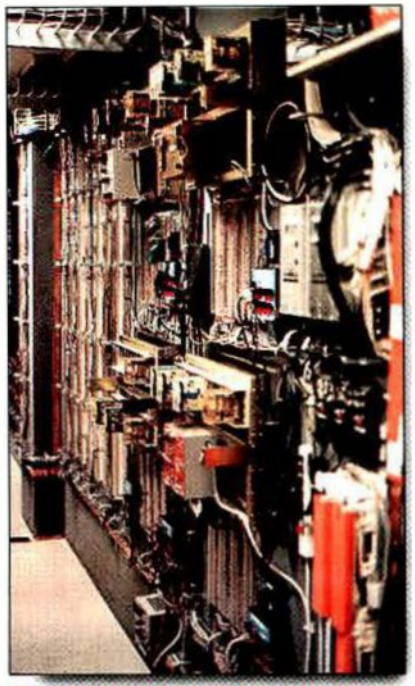
home-brewed widgets. Instead of building custom devices for each application, they used off-the-shelf products whenever possible. This approach fits the redundancy model and minimizes downtime. In contrast, if a homemade device fails, substantial time may be needed to repair it. With commercially available devices in place for relay boxes and other unique interfaces, a failed device can be quickly swapped with a new one.

Ancillary equipment

The cabling for each studio is also standardized. Each studio is tied to engineering with four conduits, and each has two 25-pair analog STP cables, one 13-pair STP digital cable, two 25-pair UTP control cables, five CAT5 cables, two CAT3 cables and two RG-59 cables. In engineering, a cable tray runs above the racks with bridges to the back wall for connections to the punch blocks.

All of the on-air delivery system computers are kept in engineering to centralize the wiring and to distance these noise sources from the control rooms. There are 12 ENCO workstations (one in each studio) and two servers. Cybex interfaces are used to extend the monitor, keyboard and mouse connections to the studios. The longest cable run is 350 feet from the CPU to the WJHM studios. (There have been no problems with this run as of yet.)

The Lighthouse routing switcher has a stereo 128 input by 128 output capacity. There are plans to double the capacity of the system. The switcher



The wall behind the rack is full of punch blocks, telephone equipment and relays.

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FACILITY SHOWCASE

The heart of the new facility lies in these 15 racks in engineering.

not only routes audio sources to each studio, but also is part of the redundant air-chain system. Each control room's main program output feeds the on-air processing through the patch bay. The auxiliary program output is fed to the Lighthouse switcher for use within the facility and for a backup feed to the processing. This allows any studio to feed any processing chain to go on-air.

On the outside

In addition to the STL antennas for each station, the roof of the facility houses three satellite dishes for AP, ABC and a 3.8m dish for C-5 feeds. A yagi and an omnidirectional

Engineering racks

There are 15 racks for broadcast use

1. Audio processing for all stations;
2. Lighthouse switcher, Eventide broadcast delay, Benchmark DAs, crown D-150A for monitoring;
3. Switchable Benchmark VU meter panel for monitoring, ENCO CPUs, Henry online phone system (on top);
4. Computer monitor with switcher for ENCO servers;
5. ENCO switchers, ENCO CPUs;
6. On-air telephone interfaces and hybrids. Each control room and production room uses a Telos 1A2 interface. Control rooms have dual Delta 100 hybrids. Production rooms have Delta 100, Telos 100 or 1+1 hybrids;
7. QEI modulation monitor, Denon tuner, additional telephone interfaces and hybrids;
8. Belar Modulation monitors, Crown Analyzer, ESE 185A GPS Master clock;
9. Four Telos Zephyrs, three Marti Smartis, AETA Scoop Reporter, processing for IFB on remote feed;
10. Patch bays, satellite receivers;
11. Marti CR-10 RPU receivers, some of them with dbx 160 compressors, Denon tuners with Benchmark audio interfaces;
12. Burk ARC-16, remote controls, CircuitWerkes TeleRadios;
13. 14, 15: RF cavities, Dolby DSTL DP-5501, Moseley 606 and 6060, Marti, Moseley DSP6000, Intraplex TDM-160, TFT EAS receivers, Sony TV SAP tuners, RF cavities.

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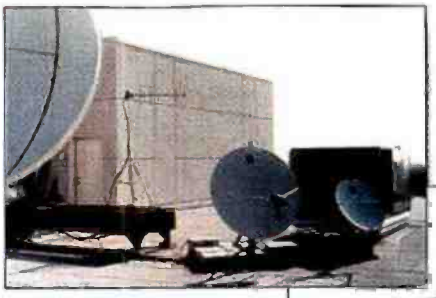
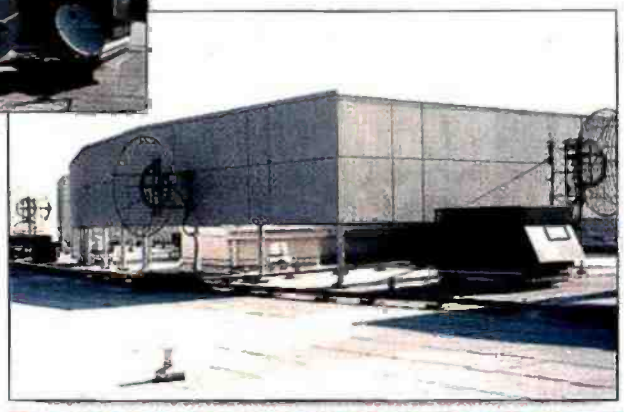
antenna are also positioned on the roof for traffic feeds and RPU reception.

Behind the facility sits the Kohler 150W generator, which is available to supply backup power to engineering, critical systems, HVAC and the studios. With any generator, noise is a concern. To combat this potential problem, the Kohler unit is housed in an enclosure that greatly reduces its noise level. The sound barrier is so effective that it is often difficult to tell that the unit is running.





The roof is also an important part of the facility, with antennas for the STLs, RPUs and satellites.

Before the move to the new facility, these four stations occupied four separate locations. WXXL alone was at its previous home for 15 years. Rather than following the trend of maximizing consolidation, the designers chose a plan that allowed the stations to retain their autonomous operation. As a result, the separate station staffs are not forced to work in a totally new environment or in a completely foreign way. The effects are a continuous evolution in station relationships and an increase in productivity.

The second production room for each station uses a Yamaha O2R console.

Thanks to Ken Skok, technical director, WHJM-FM/WXXL-FM, Orlando, for the information in this article. Interior photos by Ken Skok. Orlando skyline photo courtesy of the Orlando/Orange County Convention and Visitors Bureau Inc. Aerial photo of Pembrook Commons by Smith Aerial Photography, Winter Springs, FL.

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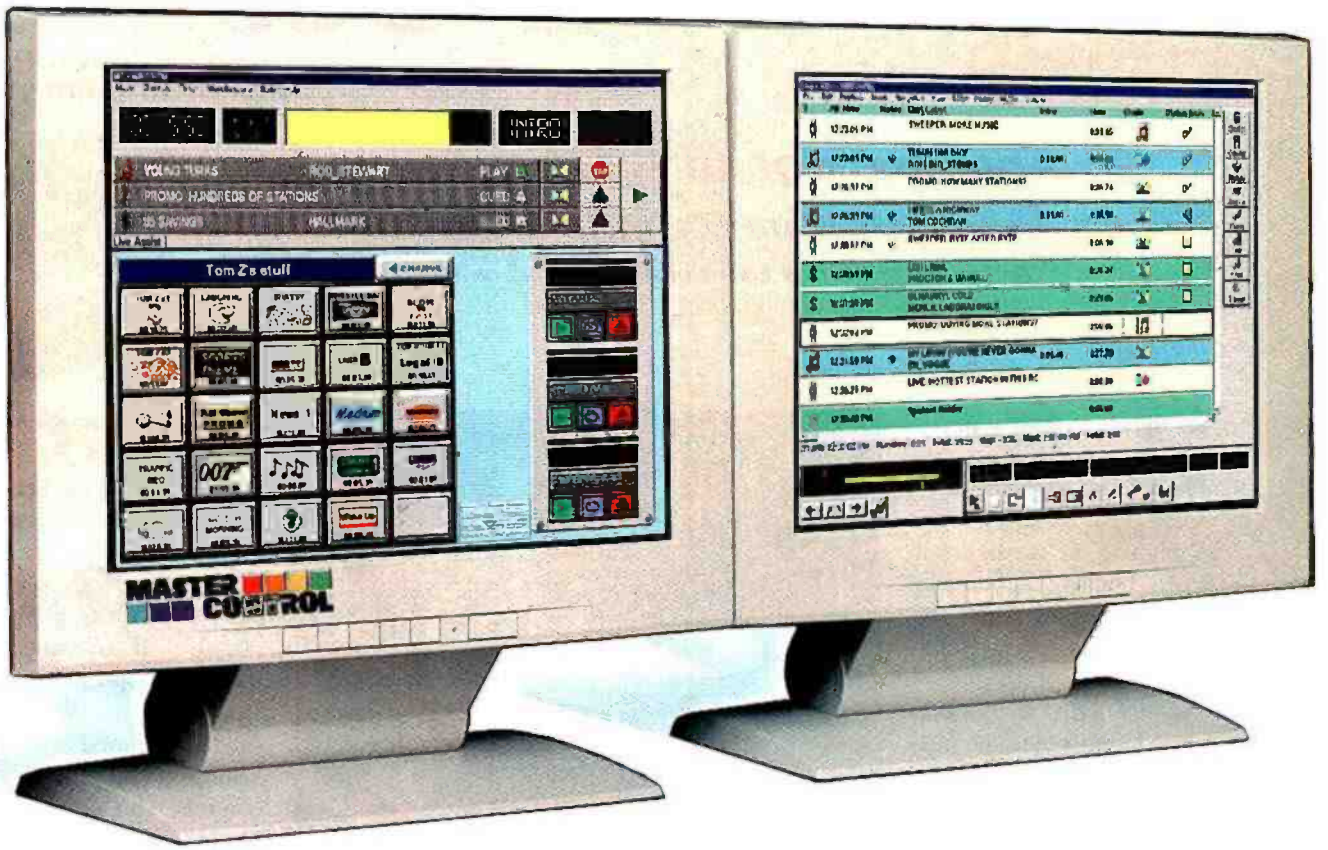

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Directional Array Details

ANTENNAS

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

Antenna monitors, DA pattern changing, DA maintenance and FCC requirements

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

Before discussing directional-array pattern changing, it is necessary to discuss antenna monitoring in more detail. When building an installation or designing a new layout, there are several points to consider.

As mentioned in the fifth article in this series, the phasor should be installed adjacent to the transmitter so an engineer can make a power adjustment and immediately monitor the effect on the antenna. Surprisingly, in a number of older installations, the transmitter is located in one building and the phasor in the middle of the antenna field. With this configuration, one person cannot simultaneously observe the phasor changes and their effects on the transmitter.

The location of the antenna monitor is even more important than that of the phasor. The most important instrument in the DA chain, the antenna monitor measures the electrical phase of each antenna relative to the phase of the reference tower. Keep in mind that the reference tower need not be tower number 1 in the array.

Feedlines and sampling lines must be maintained. Any line replacement must be made with an identical piece or the monitor sample calibration will be wrong.

The antenna monitor must be close to the phasor so that phasor changes can be read immediately. In many stations, it is necessary to walk several feet to observe the results of a phasor change. If the monitor meters are positioned beside the transmitter, they can be watched while adjusting phase and power controls. This setup makes tune-up adjustments far less time-consuming.

Sometimes it is necessary to replace an antenna monitoring system. Be sure to make a record of the sampling lines data. Measure their DC resistance at the input to the monitor with the loop or transformer attached at the tower end. If you have a bridge and generator, measure their impedance at operating frequency. It is also useful to measure the voltage appearing at the monitor input. This value can be measured with a modern FIM that has an antenna connector on the panel. Start with all attenuation in. If you

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have reason to doubt your monitor, a quick check of the previously recorded parameters will often clear up a pattern problem. If lines must be replaced, the replacements must be exact matches; otherwise, extensive recalibration will be required.

Your work will be easier if all sampling lines are the same lengths. If some lines are too long, they should be coiled and buried together with the other lines. Never leave part of a line or lines buried and part exposed. Doing so will cause phase-reading problems.

Some DAs are designated critical, often because one or more of the design azimuth parameters is calculated to 0.5 degrees. For example, an azimuth of 64.5 degrees approved in a CP application makes the array critical and calls for critical antenna monitor conditions. Paragraph 73.68 refers to these conditions. If a critical array is involved, the sampling lines must all be the same lengths. Several other conditions concerning the cables apply. It is possible to persuade the FCC engineers to remove the "critical" label by proving that the array is stable and remains within its monitor points over a designated range of values.

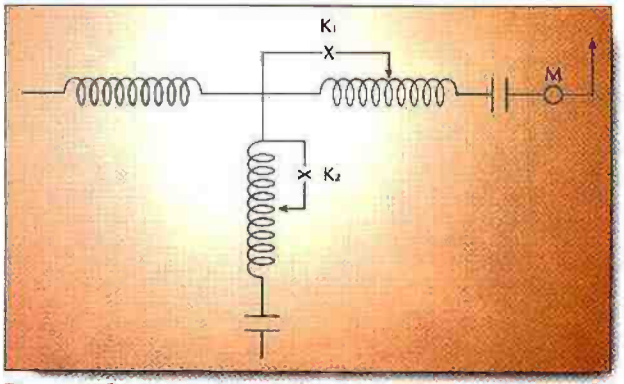

Figure 1. Contactors K_1 and K_2 are closed remotely for night operation. This procedure changes the reactance of the individual TEE arms.

The FCC has published a notice detailing the requirements for sampling lines and how to make the installation. Paragraph 73.68(b) gives details and a document is posted at www.fcc.gov/mmb/asd/decdoc/letter/1985--12--09--sample.html. In some cases, it is necessary to get approval before making changes.

Pattern changing

Directional stations commonly change patterns at sunset and sunrise. The pattern may simply go from non-DA to DA or may be completely different DA patterns. The RF contactors performing the changeover are solidly built and operate with a loud clunk. Besides changing ATU component values, the contactor operates auxiliary sets of contacts that report the DA condition back to the operator. An FCC requirement states that the operator must be sure the correct pattern is in use. When planning a new installation, it is important to include the necessary cabling to carry the operating power and the signaling information.

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MP-4	4	800W	3.3	$1,280
MP-2-4	4	2,000W	3.3	$1,820
MP-3-5	5	3,000W	4.1	$2,270
MP-3-6	6	3,000W	5.2	$2,740

LOW POWER CIRCULAR SERIES

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

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Model	Bays	Power	Gain	Price
SGP-1	1	4,000W	-3.3	$690
SGP-2	2	8,000W	0	$2,690
SGP-3	3	10,000W	1.4	$3,595
SGP-4	4	10,000W	3.3	$4,500
SGP-5	5	10,000W	4.1	$5,300
SGP-6	6	10,000W	5.2	$6,100

The antenna gain may vary with the frequency. For powers up to 20 KW please, make the request to provide the specific configuration.

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ANTENNAS

Figure 1 shows a typical ATU circuit with taps necessary to change to a new pattern or to DA from non-DA. Of course, the antenna is first tuned and the pattern is set with the desired CP impedance. Then the new pattern is set up as desired, ensuring that the CP impedance does not change with the change in pattern. Remember that changing ATU component values will usually change the CP impedance, and steps have to be taken to maintain the required value when the changeover is made. These steps involve RF contactor switching inside of the phasor. It is common practice to have two phasors, one for day and one for night operation. The two are usually combined into a single housing with a contactor that switches patterns at the common

When planning a new installation, it is important to include the necessary cabling to carry the operating power and the signaling information.

point. In this way, the same CP impedance is maintained with both patterns. There is, however, no single way to accomplish this, and there are many variations of day/night switching arrangements. Look in your proof-of-performance report for details.

Typically, maintaining desired operating parameters with a pattern change is no problem. If, however, an RF contactor sticks or only moves partway, then the new pattern will not be formed and interference will probably occur. Make sure the contacts are clean and the mechanical movements move freely. The auxiliary points should also be cleaned periodically. Rather than using highly abrasive material on contacts, use a piece of ordinary brown wrapping paper, especially on low-current contacts.

All ATU interiors should be kept clear of vermin and insects, which is difficult in winter when the ATU components provide a warm resting-place. I once was called to a station

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where the new engineer could not get the monitor points in. The logs showed that the points had been out of tolerance for two years. During a site inspection, I found a four-tower array with the remains of a rat inside the phasor power distribution coil and two other coils with nests and bones in them. After removing the remains and cleaning the coils and clips, the pattern fell right in at the same coil tap points.

Multifrequency DAs

Currently, there are not many two-frequency DA installations in use, but more will likely go into service. Obviously, it is difficult to get the exact individual patterns desired because the tower heights, spacing and azimuths are fixed. Of course, extra towers can be used for one particular frequency/pattern, but in general the designer must live with many constraints.

The same tuning requirements remain, however, and additional accept and reject filters have to be carefully

If possible, the antenna monitor, phasor and transmitter should all be near each other to make it easier to monitor the effect of any changes. The transmitter in this photo is to the engineer's left just outside the picture. (Photo courtesy of Dave Johnson.)

tuned. There is also extra work involved in checking for spurious radiation. Some U.S. systems are in use and work well. Several are in use in other parts of the world on higher powers than are normal in the U.S.

An interesting non-DA co-location occurred in the U.S. nearly 40 years ago. WNBC and WCBS shared a common antenna just off New York City. Some problems were encountered because the antenna, although fine for 880kHz for WCBS, was a little short for WNBC on 660kHz, making it difficult for the latter to meet FCC efficiency requirements. The problem was eventually solved, but situations like this, in which the frequencies are quite distant, can be made to work. Likewise, frequencies too close together pose a problem for filter-cutoff design requirements.

The most important step is keeping a comprehensive log of actions taken and changes made. Note coil taps by quarter turns or less, and mark their locations with nail polish. (This is why it is handy to use continuously variable rather than tapped coils: Dial readings can be made precisely and reset accurately.) Never turn a

phasor knob until you have noted its current reading.

DA maintenance

System maintenance is crucial. Normal inspection and cleaning are essential, but overall maintenance requires more than is customary for non-DA stations, including mandatory, regular antenna monitor readings.

The pulse of a DA system consists of the CP and the antenna monitor indications; the latter shows the system's health. A stable and properly adjusted DA system should usually run within its FCC tolerances in the absence of drastic changes in the system. Over time, as capacitors change, temperatures fluctuate and inductances and connections age, variations can usually be corrected by small changes in phasor settings.

Normal inspection and cleaning are essential, but overall maintenance requires more than is customary for non-DA stations, including mandatory, regular antenna monitor readings.

If the FIM is in proper working order, a sudden monitor point (MP) value change that is not supported by out-of-tolerance-antenna monitor readings is probably caused by the rapid growth of nearby towers or power lines, or by a radical change in the MP location. This diagnosis assumes that regular MP readings have been made and that the change is not the result of a rude awakening to a changed MP value after a period in which no measurements are made.

If you experience a sudden MP value change, don't wildly turn dials on the phasor hoping to restore the magic numbers. Check the CP current, DA tower current ratios and phases. If all read correctly, the odds are that a local disturbance has changed the MP value. Check the

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direction for maximum signal at the MP affected. The signal should come from the direction of the transmitter. If it doesn't (and it did before the disturbance), seek a cause within a reasonable distance.

Measure the other points on the radial and your alternate MP. If the alternate MP is within limits, your problem is most likely local to the MP. Determine if the MP is no longer usable. If it isn't, find a new point or use the alternate and follow the *FCC Rules* for changing MP location.

If the change occurs somewhat rapidly during the onset of winter, it is probably due to temperature changes. Ground conductivity increases as the temperature decreases. Snow usually has the greatest effect. If the array parameters remain correct, run a new radial. Plot it on log-log graph paper and determine the new conductivity. There is a procedure for changing MP values in substantiated cases. I prefer calling the FCC engineering department to discuss the situation, then I follow their recommendations. The steps necessary depend on how high the new value is. In any case, be sure to log the situation; don't ignore it hoping it will go away.

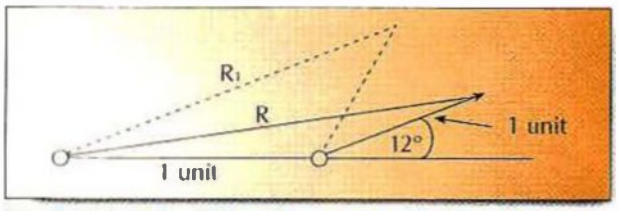


Figure 2. A vector diagram for a two-tower array showing the effect of increasing the phase relationship of Tower 2. The dotted line for R1 will shorten, reducing the signal at the monitor point.

If the MP change affects all the radials, they may have been altered by a drop in temperature. If only one radial is out and the antenna monitor shows out-of-tolerance operation, there is probably a problem in the array. Try to readjust the phasor, but don't touch the reference tower controls, and be sure to record all settings first. If a reasonably small correction brings the array in again, check the CP impedance in case you have changed it drastically. If the CP current is still okay and the antenna monitor is in, recheck the point and all other MPs. The change may have resulted from small electrical faults that eventually cleared. Keep watching for further change. Check for hot components and hot coil clamps in the system. Be aware that unperceived lightning strikes can produce incorrect meter readings. Be sure to recheck the CP impedance even when minor adjustments are made.

If it is impossible to clear the problem, lay out a vector plot of the radial to show which of the towers is causing the problem. This approach makes sense because the DA pattern is developed by vector interaction, and applying the same procedure simplifies problem analysis.

Assume that we have a simple two-tower array producing a cardioid pattern with the following antenna parameters. Tower 1 is 1/0 degrees, Tower 2 is 1/102 degrees. The line of towers runs N90°E with Tower 2 to

the east. Tower spacing is 90 degrees.

The monitor point on 90 degrees is running high. This point is also the major lobe of the pattern. We can draw the antenna vectors as follows. From the origin, draw a vector that represents Tower 1. Make it one unit long at 90 degrees (0 degrees tower spacing, and 0 degrees electrical phase, see Figure 2).

From the end of this vector, draw the vector for Tower 2, also one unit long at an angle of 12 degrees [-90 degrees (tower spacing) +102 degrees (electrical phase)].

The distance (resultant) from the origin to the end of the vector for Tower 2 shows how changes in antenna parameters affect the value of a monitor point. If the Tower 2 phase angle decreases, the resultant will be longer, producing a higher field at the monitor point. Should the Tower 2 phase angle increase, the resultant will shorten, producing a lower field at the monitor point.

If more towers are involved, each tower's vector is drawn from the end of the preceding vector. Remember that positive vectors revolve counterclockwise starting at zero and negative vectors rotate clockwise measured from the X axis (horizontal). This method is far easier than it sounds, although it becomes more complicated with more towers and MPs off the line of towers.[1]

FCC Rules pertaining to DAs

Following is a list of all the *FCC Rules* that apply to directional antennas. These rules apply to new applications as well as existing stations. A few other rules apply to AM antennas but not specifically to DAs.

- §73.51 Operating Power
- §73.54 Antenna Resistance and Reactance Measurements
- §73.58 Indicating Instruments
- §73.61 DA Field Strength Measurements
- §73.62 Directional Antenna Operating Tolerances
- §73.68 Sampling Systems
- §73.69 Antenna Monitors
- §73.150 DA Systems
- §73.151 DA Measurements
- §73.152 Modification of DA Pattern (Augmentation)
- §73.154 AM DA Partial Proof
- §73.157 AM DA Daytime Tests
- §73.158 Monitoring Points
- §73.186 Effective Field at 1km

1. For a full representation of the procedure, see Jack Layton's *Directional Antennas Made Simple.*

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

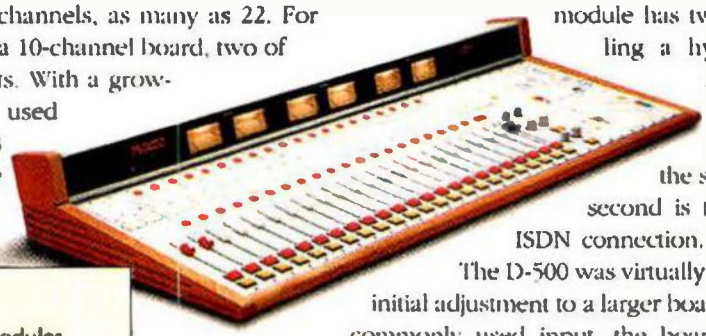
This is the sixth in a series of nine articles on basic broadcast antennas. Upcoming installments will appear monthly in BE Radio *through 1999. Once all the installments are published, the series will be available for purchase as a single document. For information regarding bulk orders of this series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

Wheatstone D-500

By David C. Wright

After more than 12 years in the planning, WUNC has finally constructed a new studio and office facility, which became operational in January. When the project was envisioned, digital technology for radio stations was just emerging. During the studio's long incubation period, digital technology advanced significantly: The station installed a digital STL path and a digital exciter. For the new air studio, a digital board was necessary to supply a signal from the digital NPR satellite feed and other digital sources right through to the exciter.

The goal for the studio was to provide a digital path for as many sources as possible. One of the main requirements was multiple input channels, as many as 22. For years, the station had used a 10-channel board, two of which were multiline inputs. With a growing number of regularly used audio sources, the A and B inputs to each channel were used, which sometimes led to operator mistakes.



Performance at a glance

- Analog, digital, line or mic input modules
- Modular design
- Economical analog to digital module upgrades
- Three sets of VU meters
- Four stereo program buses
- Analog and digital outputs for each bus
- SuperPhone module for two hybrids
- 16, 24 or 32 input module frames

For the new console, it was crucial to have a console channel for each regularly used input: mic, CD, DAT, turntable, cart, networks, studios, remote and telephone. We also required a modular design in which analog or digital input modules could be placed in any mainframe input position. We needed both balanced analog and AES/EBU digital outputs for at least four mixing buses. We also needed a quick turnaround and reliable service. We looked at a number of digital consoles and found that the Wheatstone D-500 met our criteria and exceeded our technical requirements.

The D-500 has a modular design that consists of individual input, output and accessory modules. The internal bus structure is designed so that digital or analog input channels can be placed in any mainframe input position. The console has balanced stereo analog audio and an AES/EBU digital output for the four mix buses: PGM, AUD, AUX and UTL. The fifth stereo bus, CUE, has high-quality internal speakers as well as an analog output.

Versatile modules

The console is available in 16, 24 and 32 input frames; ours is a 24-input mainframe. Input modules can be placed in any configuration of analog, digital, line or mic and in any input module location. We actually changed the layout of the input modules to accommodate our talent after we put the board in place — just weeks before going on-air.

With the SuperPhone input module, there are two mix-minus buses for use with this interface. The mix-minus source feed on the telephone module can be automatically generated from any of four stereo buses, and the feed is generated digitally without analog nulling circuits. The module has two faders, each controlling a hybrid or other remote source. We have configured ours so the first fader is the default for the single studio hybrid. The second is the default for a mono ISDN connection.

The D-500 was virtually plug-and-play. After the initial adjustment to a larger board with a fader for every commonly used input, the board operators and talent found the transition almost seamless, since the console resembles traditional analog consoles.

Some of the console's features provide definite advantages. For example, the input mode selector on each input channel provides for selection of right, left, stereo or mono. This configuration is more convenient than the patch cables we once used. Another advantage is the built-in speakers for the stereo cue buses.

More features

The auxiliary bus is another plus. We will use it for a second program stream to our uplink, feeding additional stations. WUNC has two translators on the North Carolina Outer Banks, an arrangement to supply programming to another station and pending applications for four stations. This additional bus capability definitely influenced our selection of the D-500.

The console presents a simple, low profile with a chice of quality hardwood ends. The meter bridge consists of three sets of VU meters for PGM, AUD and a third set switchable between AUD, AUX, UTL, EXT1, EXT2 and cue. The bridge also has a clock and timer. We upgraded the clock to a Torpey Time clock to synchronize with NPR's time code, which is a must because we are an NPR station. The timer has stop/start, reset and auto controls.

Each input module can be programmed to reset the timer when it is turned on. During installation, we found that several of the input modules did not have the published defaults for timer, muting and other settings. But this was not a serious problem and was easily corrected with dip switch settings on the affected modules.

Since the D-500 has been on the air, we have had no problems. The signal-to-noise ratio is excellent, and there are no digital artifacts. The board modules can be hot-swapped, a setup that allows servicing and changes to the board while live on-air. We are still developing the techniques and tools needed to troubleshoot the board should a problem develop.

Digital sources throughout our facility are asynchronous, but if there were a need to synchronize them to the same clock, the D-500 would be able to do so. Initially, there was one problem concerning the board's input bit rate from the hard-disk system. One cart had been recorded at the unusual sampling rate of 22kHz, and the input module lacked the ability to recognize and pass the audio. We corrected this problem by making sure that all the audio was recorded onto the hard-disk system at a 32kHz minimum. However, Wheatstone has since told me that the D-500 does accept 22kHz sampled inputs if the master console rate is set to 44.1kHz.

Flexibility

One feature particularly suited to our needs is cueing. The headphones can be programmed to put cue in one channel or both channels, which allows us to monitor the network during local breaks. The cue speakers are built into the console, and cue can be external if the need arises.

The flexibility of the line preselector module is another welcome feature. The preselector is a set of switches on the board controlling an outboard 1RU module that will take any combination of eight analog or digital inputs. The unit then supplies simultaneous analog and digital outputs to be wired to an input module. In our case, the digital output is wired to the A input of a digital input module. The analog out is then wired to the B input of an analog module as a backup.

The station's air talent discovered one limitation in the console: the location of the line-selector switches. These switches are located on the lower third of the module surface, in the same area as the fader travel. One of our selectors is positioned near the middle of the board in a heavy-traffic area. The switches are light to the touch and, if something is dropped or placed on top of them, the input can inadvertently be switched. These switches should be positioned above the fader level, less susceptible to traffic.

The console manual is not as detailed as it could be. The one we currently have is primarily an installation and setup manual. When it comes to setting up or servicing the console, however, we have had great support from Wheatstone. A visit to the company's new production plant to look behind the scenes reassured us that the company will provide good support for a well-designed product.

In all, the D-500 is designed with simple elegance. It provides a complete digital path and melds the look and feel of a traditional console with the future of digital technology.

David C. Wright is director of engineering for WUNC Radio, Chapel Hill, NC. Contact him at dwright@wunc.org.

Editor's note: *Field Reports are an exclusive* BE Radio *feature for radio broadcasters. Each report is prepared by well-qualified staff at a radio station, production facility or consulting company.*

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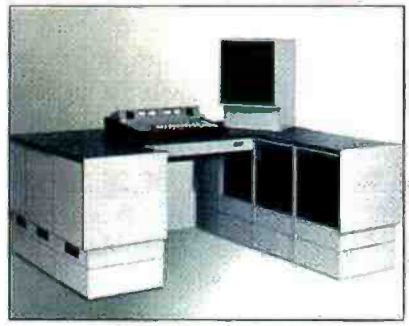

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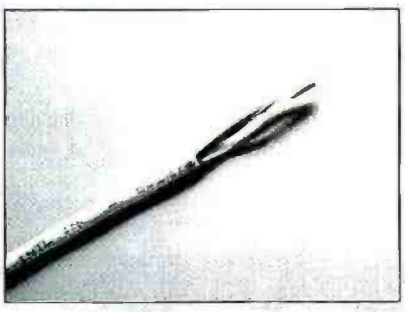

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The Studio Spotlight: *BE Radio* brings you into some of the newest radio on air and production facilities in the country. This website feature shows you the studios and tells you what was done to make it the showcase facility that it is. All the previous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

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Prophet Systems Innovations: Taking the features of the industry-leading digital automation system AudioWizard™ and programming it in a more powerful language, PSi offers the next generation of virtual radio, NexGen Digital Broadcasting™] NexGen Digital Broadcasting is incredibly scalable. Its ambitious design meets the complex performance needs and budget requirements of broadcasters ranging from big duopolies to stations that prefer to remain independent.

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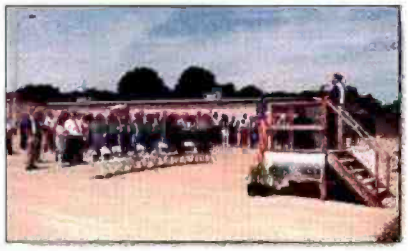
***BE Radio* magazine:** *BE Radio* gives radio station managers and engineers the information they need to make critical equipment purchase decisions. The magazine is published 10 times a year and distributed to over 14,000 qualified subscribers in North America. Look online for the Studio Spotlight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

www.neutrikusa.com

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

Business/People

Broadcast Electronics celebrated its 40th year in business on June 18, 1999. BE was founded in Silver Spring, MD, in 1959 and relocated to Quincy, IL, in 1977.



BE has also announced the signing of an agreement for the sale of its **Broadcast Programming** business to Denver-based **Jones Radio Network**, a subsidiary of Jones International Networks Ltd. The transaction is expected to close midsummer. The move supports the company's continued focus on the core strategy of providing innovative technology-based products and services for the broadcasting industry.

The 53rd annual **Mid-Atlantic States Expo** was held June 7-8 at the Trump's World Fair Casino in Atlantic City. A.R.M.A The exhibits and technical sessions were arranged by **ARMA**. Approximately 20 exhibitors displayed their products on the show floor. Technical sessions included webcasting, radio automation, IBOC, EAS, and studio wiring and signal routing.

Plans are currently being made for next year's ARMA convention. For more information on ARMA, contact the organization at (609) 653-6130, mail@armagroup.org.

News

DAB update

Lucent Digital Radio and **Nautel Limited** will cooperate on implementing lab and field testing of transmitter technology that will facilitate IBOC AM-band DAB. The two will jointly conduct laboratory testing at Nautel's research and development facilities using Lucent Digital Radio's prototype waveform generator. Plans are also underway for real-world field testing at commercially operating AM stations in the U.S.

Also, LDR has announced an agreement with **Electronic Research Inc.** to jointly develop combiner technology that can be used in Lucent's IBOC DAB system. The technology will combine the existing analog host signal and the new digital FM signal. LDR is already using a prototype IBOC combiner in tests of its IBOC system at NPR member station WBJB-FM in New Jersey. Previously, LDR announced that it had successfully tested its IBOC system live and over the air at WBJB-FM with no degradation of the host FM analog channel during the transmission of the digital FM signal over the same FM band.

LDR will use ERI's IBOC combiners at other field test locations. The two will also explore alternatives to combining technologies, such as advanced antenna technologies. Besides helping to implement IBOC, the new technologies will lower the cost of its deployment.

SBE, NFL to cooperate on frequency coordination

The SBE and the NFL have announced a cooperative effort to coordinate frequency use for all regular season and post-season NFL games beginning with the 1999 season.

Frequencies will be coordinated with local and visiting team radio stations, TV networks, equipment suppliers and other spectrum users within the stadium and its surrounding environment. Problems that cannot be resolved by mutual consent will be reported to the NFL, and efforts will be made to find amicable solutions.

The NFL will equip each game coordinator with a laptop computer, a scanner and a telephone. Coordinators will also have a space in the press box to operate from and two "All Access" credentials. The SBE has authored a booklet of standard event operating procedures that the game coordinators will use.

The **BEST** Will Be in Orlando!

The NAB Radio Show gives you the opportunity to interact with some of the **BEST** Radio Group Executives.

Ed Christian, Saga Communications **Dick Ferguson**, Cox Radio

David Field, Entercom **Ken O'Keefe**, AMFM, Inc.

Randy Michaels, Clear Channel Communications **Erica Farber**, Radio & Records, Moderator

*Participants in this year's Group Executive Super Session — **Thursday 9/2***

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BE Radio

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Services

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Swager Communications	88	186	800-968-5601
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Wheatstone Corporation	98	103	252-638-7000
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BE RADIO (ISSN 1081-3357) is published monthly (except bimonthly in May/June and November/December) and mailed free to qualified recipients by INTERTEC, 9800 Metcalf, Overland Park, KS 66212-2215. Non-qualified persons may subscribe at the following rates: USA and Canada, one year, $30.00; all other countries, one year, $35.00 (surface mail), $70.00 (air mail). Single copy price, $10.00. Periodicals postage paid at Shawnee Mission, KS, and additional mailing offices. Canada Post International Publications Mail (Canadian Distribution) Sales Agreement No. 0956244. POSTMASTER: Send address changes to *BE Radio*, P.O. Box 12937, Overland Park, KS 66282-2937. *BE Radio* is edited for corporate management, technical management/engineering and operations and station management at radio stations and recording studios. Qualified persons also include consultants, contract engineers and dealer/distributors of radio broadcast equipment.

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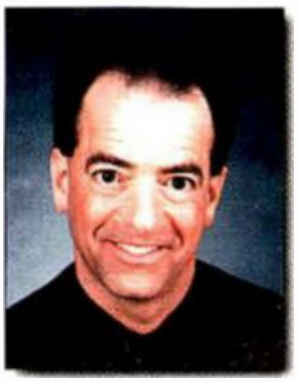
Road trip

By Skip Pizzi, executive editor

Earlier this summer, I took my 10-year-old son to camp. During the drive there, my son asked me to turn on the radio to see what the stations in a particular area were like. When I turned on the audio system, it started playing a track from the CD we were listening to earlier. My son thought he was hearing the radio, and he exclaimed, "Wow, leave it on that station! That's one of my favorite songs." About two seconds later, he realized we were listening to one of his CDs, and he said, disappointedly, "Never mind, turn it off, Dad." I replied, "Wait, you just said that was one of your favorite songs. Why do you want me to turn it off now?" "Well, I thought it was on the radio," he replied.



For the next few miles, the conversation turned into a mini-focus group, as I probed why it mattered so much to him whether the song were on the radio or on a CD. He told me he would feel affirmed if someone else liked his favorite song enough to play it on the air. Further, he said it felt different to hear a song so many others were listening to at the same time. He also knew that this particular song was not a current hit, and he was therefore even more surprised and pleased to hear it on the radio. Clearly, the communal nature of radio broadcasting mattered to my son. He enjoyed not just the content, but also the simultaneous, common experience of that content.

Radio's new audience

I thought about the meaning of this revelation for the rest of the trip, in the context of emerging technologies like Internet radio, MP3 players and the like, all of which are familiar to younger audiences. My son's perspective gave me hope that conventional radio broadcasting might maintain a unique appeal in a future fraught with new competition, much of which caters to a fragmented and customized individual experience.

Then I thought about DBS radio, particularly how it might be received by the audience of tomorrow. If a communal experience were so important, wouldn't it stand to reason that a *nationally* shared moment would be even more powerful than a local one? Again, my son — unfettered by the burdens of technical analyses and business models — helped me understand the audience dynamics in undiluted fashion. He said he wanted to listen to the radio as we traveled into unfamiliar territory so he could hear what people liked "around here." In other words, broadcasting's localism was an important part of *exploration*, something that every kid enjoys. Unfortunately, today's local radio, particularly in smaller markets, tells us little about local tastes and styles. Only a few of the commercials seem to be market-specific.

Conventional radio broadcasting might maintain a unique appeal in a future that caters to a customized individual experience.

As the drive wore on, another memory flashed in my mind. I recalled the image of this same child at home, grabbing his portable radio and a cordless phone as if they were bookends — two mating pieces of a single device — and going off to his room to listen to the radio. To him, this meant listening *and* calling in. He's a fan of the kid's radio channels, whose programmers obviously understand their audience, as they exhort listeners to call in between every song, for requests, contests, quizzes and even to relate minutiae like what they had for breakfast. To him, radio is an interactive experience, and localism makes it easier for him to be a part of it. It also means he has a closer connection to who and where the other callers are.

The future of radio

Let's hope at least a few of today's motivated young listeners will remain interested enough in the medium to become its programmers in the future — and that management will be smart enough to hire them. Perhaps their formula will not exploit radio's real-time mass connection, but rather result in more interactivity and renewed localism. Or maybe something totally unexpected will emerge.

In any case, we can only hope the future industry leaders will be able to reinvent the medium yet again and, in a diversified media landscape, ensure that radio continues to be something we all want to take with us wherever we go.

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–Troy Richards at KCCS

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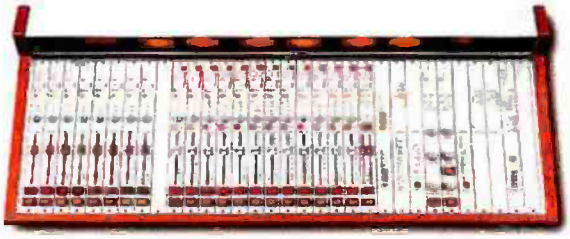

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