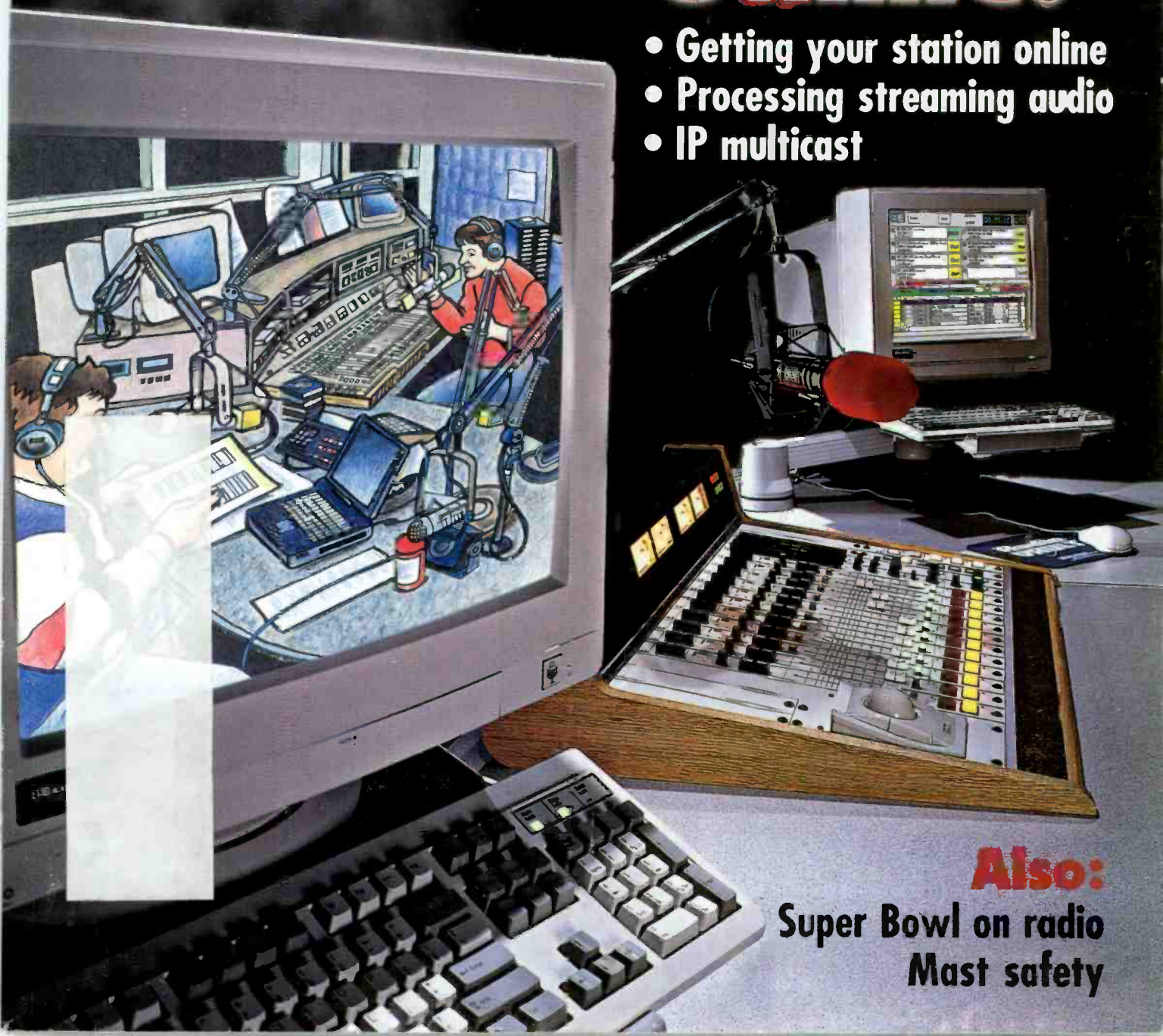
BE Radio

February 1998/$10.00
An INTERTEC®/PRIMEDIA Publication

Radio Online:

- Getting your station online
- Processing streaming audio
- IP multicast



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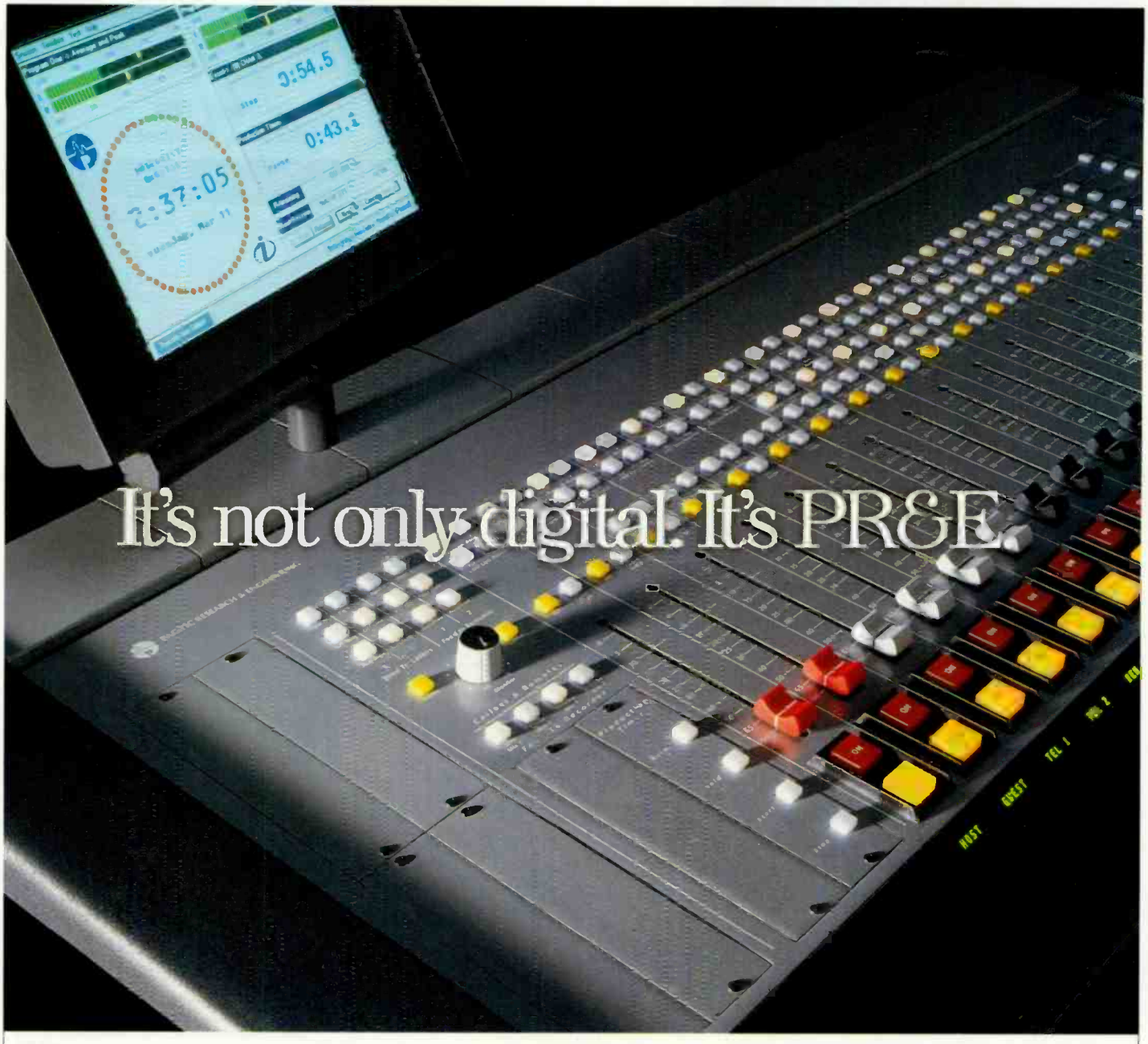

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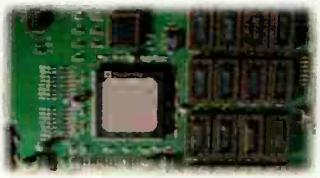

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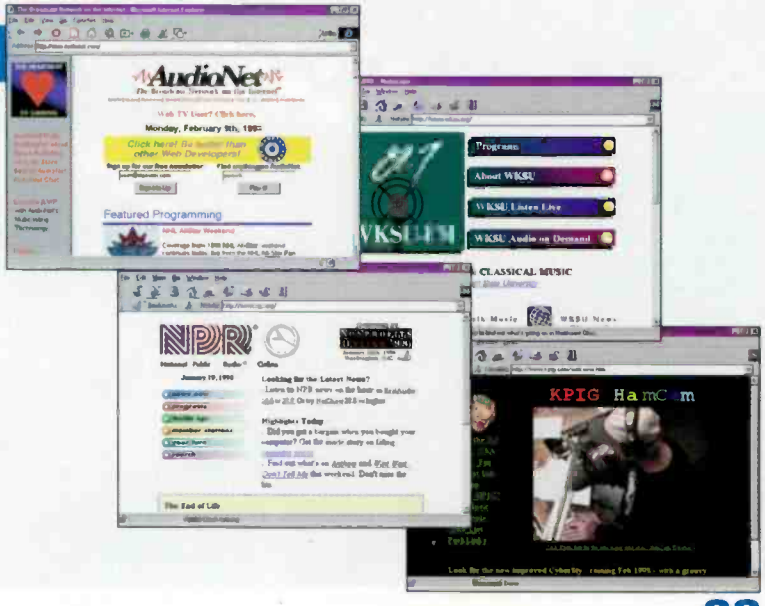

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Editorial

Bits is bits

As radio broadcasters move deeper into the digital age, they're approaching an important transition. It's already well underway, although you may not have noticed. Eventually it will become obvious that most of the hardware we use in radio is no longer *audio specific*. As with all digital media, the exception will be transducers (microphones, speakers and their associated drive electronics), which will always remain dedicated devices for capturing and regenerating acoustical energy. But the paths between these terminal devices will consist largely, if not entirely, of general-purpose digital hardware.

"One change leaves the way open for the introduction of others."
– *Niccolò Machiavelli*

In the language of the computer world, we are moving away from *appliances* and toward *platforms*. But this trend signals a far bigger and potentially more important change.

If audio is only one facet of the content that radio production systems can manage, might it also not become just one of the products the medium can deliver? In other words, if the *hardware* is no longer audio-specific, the *channels* needn't be either. Radio broadcasting could break its traditional, singular association with audio content, taking on additional or completely new types of deliverables. Radio could become a multimedia delivery system (in the truest sense of the word), producing and delivering any kind of media content that make good business and/or public-service sense – over the air or otherwise.

To start this new market analysis, ask not *what* radio can deliver – ask *where* or *how* radio can deliver it. For example, FM radio is an inexpensive and robust way of delivering moderately wide bandwidth to an *unlimited* number of points within a local distribution area (typically a population center), including *mobile* reception. It is these attributes that should be examined when evaluating future options, not the assumption that radio is simply an aural broadcasting service.

Changing impressions of yourself in such a fundamental way is not an easy maneuver, but it may be a necessary one. The younger competition emerging today (like DBS and cable) is thinking this way from the start. It's easy for them because they carry no baggage of tradition, and they *must* seek new methods as they search for a foothold in the media marketplace. The tired old metaphor that continually comes to my mind (and which you've seen on this page before) bears repeating: If the passenger train industry had thought of itself as being in the *transportation* business, not the *train* business, we might be flying "Union Pacific Airlines" or "Air B&O" today.

Today's aging giants are the telco and broadcast industries. You can't blame them for trying to eke out whatever they still can from their existing infrastructures. But both industries are also attempting a circle-the-wagons, consolidation strategy to fend off the newcomers, and this may not be prudent for the long term. While it may help today's bottom line, the inertia it adds may actually be detrimental to the agility required for the leap into this new environment of digital delivery.

Whoever inherits the audiences served by today's radio broadcasters may still end up transmitting music and news, but it's probably not going to be the only thing they do. The world of digital telecommunications removes many earlier media-specific constraints. Tomorrow's winners will be those who exploit this freedom in the most efficient, marketable and audience-friendly ways. It's time to start thinking outside the audio-only box.

Skip Pizzi, editor-in-chief

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BE

Solutions For Tomorrow's Radio

Viewpoint

Lest we forget

Technology moves us forward every day. The role of the broadcast engineer has changed dramatically since the early days of radio, and this issue of BE Radio reflects that. A good part of this issue deals with radio and the Internet, a relatively new relationship and another area in which the broadcast engineer must be literate.

Knowing where you're going is made simpler by knowing where you've been. The early days of radio had several pioneers and heroes. While many of these early inventors had great corporate support for their work, one faced more of a struggle. Major Edwin H. Armstrong (1890 - 1954) made important discoveries in the field and was the father of several inventions, the four most notable of which were the regenerative circuit (1912), the superheterodyne circuit (1918), the super-regenerative circuit (1922) and the complete FM system (1933). His inventions and developments formed the backbone of radio communications as we know it.

A great body of the artifacts from Armstrong's work were scattered over time. Some of his prototype design models made their way into various museums. But unlike Henry Ford or Thomas Edison, whose work was archived in libraries, Armstrong's notes and letters were put into storage and almost forgotten. It's the letters and notes made during his working life that really tell the story.

Armstrong's assistant and friend, Harry Houck, saved the materials with plans for one day building a museum. That never happened. Houck's nephew, Gilbert, later worked to gather the collection and keep it whole for the future.

By now you're wondering what tie the Internet has with Armstrong. Recently, I was told about a website that captures much of the story and makes it available to everyone. It's not a biography per se, but rather a glimpse into the back room of a museum. Check it out for yourself at www.erols.com/oldradio/.

The equipment has been photographed and that collection, as well as Armstrong's papers, have been scanned and presented online. These images tell the story just as well as any biography could, but you can get a deeper feel the events — the legal victory over de Forest on the regenerative circuit, or the first production FM receiver — than you could from a book. The site even covers some of the occurrences in Armstrong's military life, telling the visitor what it was like for him to be transferred to France, or even promoted to Major.

My compliments go to Mike Katzdorn, the man who put the site together. He is a true fan Armstrong's and it shows. The site gives the visitor an "old-meets-new" feel — the newness of the Web and the history that's being made available. If you're new to radio broadcasting, you'll find the find the site a good lesson in how far we've come. If you've been in radio for a long time, perhaps it will stir some of those memories.

It's obvious that the Web has to become an accepted — and even expected — resource. How many times have you gone online to download a driver or software update? Maybe you've visited a manufacturer's site to get more information about a product. It's simpler than picking up the phone and calling someone. If your station isn't running its own website, think of how many listeners have looked for you online with no results. Then think about how many will over the next year.

On the road

The Michigan Association of Broadcasters will hold the Great Lakes Broadcasting Conference and Expo on February 24 and 25 in Lansing, MI. Chriss will lead a session on the progress of DAB in the US on Tuesday morning. Contact the MAB at www.michmab.com, or (800) YOUR-MAB.

Chriss Scherer

Chriss Scherer, editor

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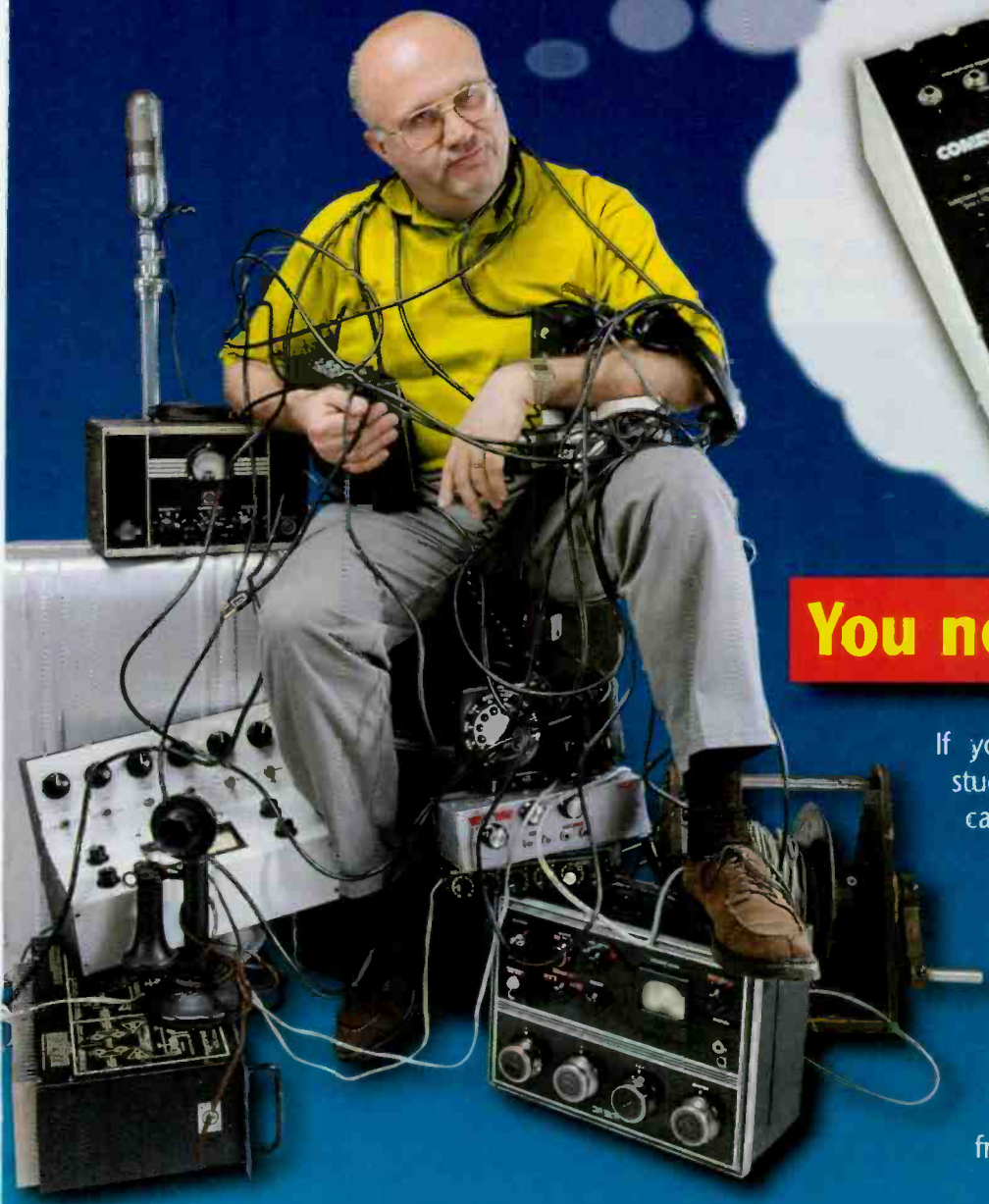
Is your remote gear weighing you down?



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Circle (17) on Free Info Card

Maintaining your computers

By Kevin McNamara, CNE

Computers have become so commonplace in our lives that most of us forget they require maintenance. After all, they usually boot up when you turn the power on, right? Improvements in the manufacturing process of computer components, combined with stringent quality control have made the PC and the associated peripherals, even the cheap ones, reasonably reliable.

With prices for PC components lower than ever and still dropping, it is easy to adopt the "I'll just replace it when it fails" attitude. But keep in mind, the real cost of a system failure is the time and expense that results from the lost data or airtime.

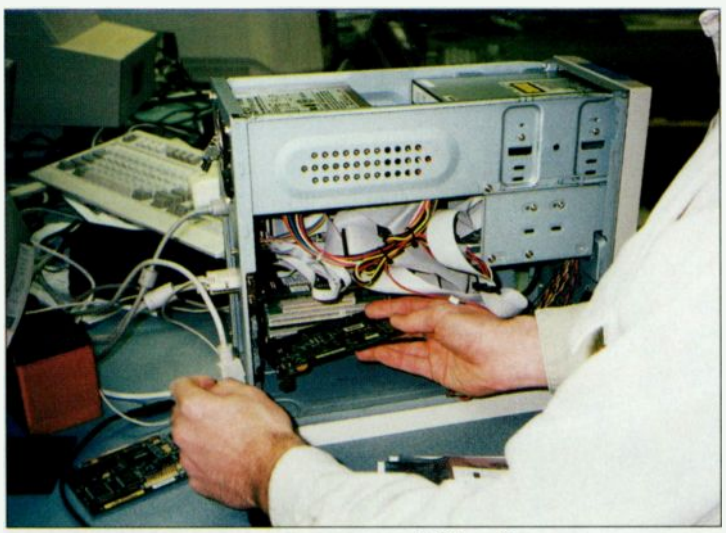
The maintenance requirements for computer equipment are fairly basic. They can be divided into two general categories: physical and data.

Physical maintenance

The amount of physical maintenance is minimal and determined by the location and specific environment in which the PC hardware will reside. As computers become more powerful and clock speeds increase, so does the duty cycle of the CPU and associated memory ICs. The net result is that these chips operate at increasingly higher temperatures with each new product release. The fan(s) on a computer are designed to blow air out the back, which causes air to be drawn in through open vents in the front. This creates airflow in and around the motherboard and the other components inside the cabinet. Dust accumulating on these vents and inside the unit restricts airflow and consequently the life of the components. Maintaining good airflow through the PC's cabinet is essential. Keeping your equipment in a temperature controlled "clean room" environment is ideal, though few of us have that luxury. It should be considered, however, if you are building a new facility.

Make sure all unused card slots and I/O ports on the back of the computer are covered. If you experience intermittent failures, try re-seating any plug-in cards and any connectors attached to each drive. I've also found that simply using canned air, which can be purchased in various forms at most computer and electronic stores, is the most effective method to remove dust and other airborne particles from inside the PC cabinet. The air can also be used on keyboards, floppy/cd-rom/tape drives, monitors and other external peripherals.

Hard drives are sealed units and are not normally affected by the environment, however the drive can be damaged by abrupt power-downs. An un-interruptible power supply (UPS) is an effective means of circumventing that kind of damage.



Reseating cards can help eliminate intermittent failures.

UPSs are not only more affordable, but smarter. Most UPS systems on the market today provide a means to shut down your computer softly in the event of a power failure, minimizing data loss and avoiding drive damage. If you own a UPS, don't forget to check the battery periodically.

Data maintenance

The first line of defense in reducing your chances of data loss is to create a schedule for backing up all of your critical data. Several options are now available, including tape, high-density disks, optical and magneto-optical drives. Which one you use depends on your specific needs and budget. If you have PCs attached to a network, consider purchasing a RAID (redundant array of independent disks) multiple drive system which uses various methods to store data on multiple disks. If that is not an option, backing up data to another drive on the network can also be effective.

You can reduce your chances of losing data on your machine through the regular

use of assorted hard drive utilities on the market. There are two forms of data maintenance that you need to use: hard drive and virus checking utilities. Current operating

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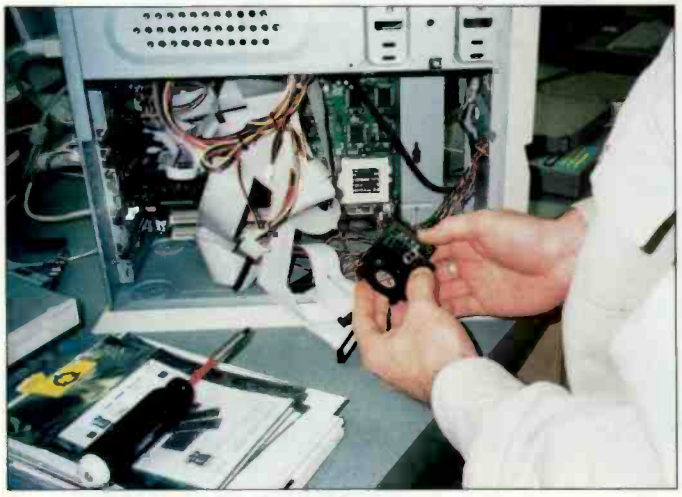
systems include utilities which not only format, but also identify and repair errors on your hard drive(s). Both the Windows 95 and Windows NT operating systems include two excellent hard drive utilities.

The process of reading, writing and erasing data may cause files to "fragment" across your hard drive. Fragmented files can cause data loss and waste disk space. Using the disk defragmenter utility will reconnect those files and eliminate remaining fragments of previously erased files. ScanDisk is an included utility that checks the integrity of your drive and fixes many types of errors. Both of these utilities should be run on a regular basis and can be set to operate automatically at predetermined intervals.

Hard drive viruses come in several forms and new types are appearing every week. The damage that these viruses cause ranges from harmless nuisances to permanent damage to your drive and/or system. Of course, your risk is minimized if access to your system is limited to yourself and people you trust; however, if you load files from a disk or download them from the Internet, your chances of getting infected rise dramatically.

There are many good programs that not only find and eliminate existing viruses, but can remain resident in your system and intercept viruses from external sources before they have a chance to infect your system.

Remember, hard drives are mechanical devices and have a finite life. Keep an ear out for drives that are beginning to wear. These tend to exhibit typical "bearing" wear noises, such as whining.



Be sure all the fans are clear of dust.

Updating your software

Software and their subsequent upgrades are being released at ever decreasing intervals. Have you noticed that the software you buy off-the-shelf is out of date the day you buy it? Many times a new "fix" or "patch" needs to be downloaded in order keep the soft-

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- Enhanced signal within the broadcast coverage area
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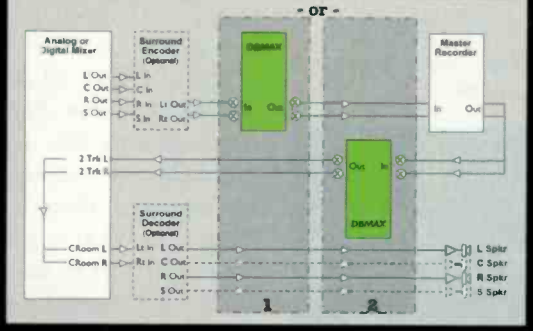

TV or Radio Production & Transmission Emulation

Example of production for DAB, Digital TV and FM

1) Production: DBMAX inserted pre-master to optimize production.
2) TX Emulation: DBMAX inserted post-master for transmission emulation

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ware current. Most major software manufacturers are releasing these fixes on the Internet. There are even programs available that analyze the current version of programs on your drive and download the appropriate updates automatically.

Network maintenance

For those of you that are the network "gurus," here are a few items that will save you a maintenance call.

Cabling can directly affect the performance of your network, something particularly true if you send digital audio/video through the system. Just one faulty cable segment in your network can cause performance problems everywhere. If you own or have access to a network cable analyzer/time domain reflectometer (TDR), check the integrity of each run of cabling in your facility. If you have not tested the cabling previously, you may find a situation that could be causing network performance problems. If you have previous documentation of your cabling, re-testing it

If you have not tested the cabling previously, you may find a situation that could be causing network performance problems.

may reveal changes that can also impact present performance or allow you the chance to correct a future problem.

If you have the proper supervisor rights to the network, you should consider cleaning up your server(s). First, compare the authorized user list in the server with the names of those who should have access. It's not unusual to find several previously authorized users that no longer work for the company. Also, make sure that the remaining users have access to only those portions of the network that they need. All current network operating systems have utilities for managing users and their specific levels of access.

Second, check all of the network drives for files that are no longer in use. For example, if the sales department is connected to the server, you may find old proposals, presentations and schedules. If your system stores music and/or spots, there may be a lot of old data that can go. While you are at it, establish a limit on the amount of space that each user can use to save data on the network. This can also be set through the utilities.

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

Editor's note: *Photos by Colin Pestinger.*

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Circle (6) on Free Info Card

Establishing your facility's intranet

By Brad Gilmer

What is the difference between the Internet, an intranet and an extranet?

The Internet is a network of computers and interconnections that spans the globe. You can view information stored on computers with a browser without worrying whether the computer at the other end is compatible with yours, or whether it is running the same software you are.

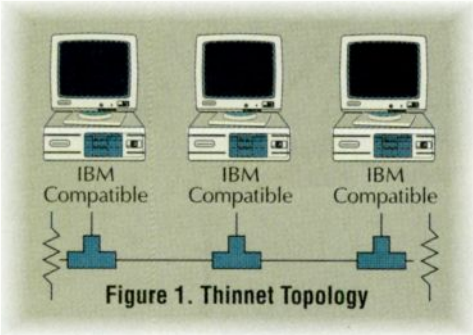

Figure 1. Thinnet Topology

An intranet is a smaller version of the Internet. Intranets are usually confined to a single geographic location, perhaps even confined to one building. They employ the same technology used on the Internet, and you usually use a browser to access information on your intranet. You can link your intranet to the Internet, but it is not necessary to do so.

Theoretically, an extranet is an intergalactic network run by extra-terrestrials. Okay, perhaps that is not what extranet is, but it is the first thing that came to mind when I first saw the term.

Extranets are a bunch of intranets connected by the Internet. How's that for confusing? It actually makes sense when you think about it. If you are part of a station group, you might have your station in Cincinnati, another in Kansas City, another in San Francisco, and so on. If you establish intranets at all these facilities, you might want to hook them together so that you can share access to internal data like sales figures or engineering purchases.

The obvious candidate to connect all these intranets together is the Internet. But there is a concern — the Internet is populated with a number of very bright and slightly mischievous people with time on their hands (college students), some of who might try to break into your computer systems. Extranets use special firewall systems that encrypt the data as it is sent from one location to another. Firewalls also lock out unauthorized users while allowing authorized users to access servers and files throughout the system as if located in the same building.

The basic parameters of your intranet

There are a few items you should consider before you start building your intranet:

- How many people will be accessing it?
- Who will be using it?
- What will they be using it for?
- How critical will the intranet be to the business and does the system need to be backed up?
- What sort of services do you want to support — e-mail, FTP, Web-type browsing, mounting of remote disk volumes, Telnet to control remote machines, etc.

Once you have answered these questions, you are ready to start building your intranet.

Getting it built

There are two components to an intranet — hardware and software.

First, let's talk about the hardware. Clearly, if you are going to have an Internet, intranet or extranet, you need a network. There are two common types of hardware systems used to interconnect computers these days — thinnet and 10Base-T. Thinnet consists of a daisy chain of computers interconnected using RG-58 coax and BNC Ts. (See figure 1.) A thinnet network must have two terminators, one at each end of the daisy chain. The BNC Ts must connect directly to the back of the computers. You are not permitted to use a stub between the T and the computer.

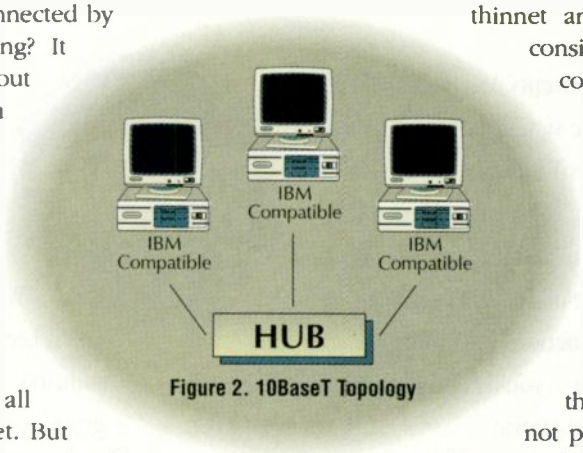

Figure 2. 10BaseT Topology

10Base-T uses unshielded twisted pair (UTP) cable terminated with RJ-45 connectors (wide telephone connectors). UTP looks a lot like multi-pair telephone cable. It is usually solid conductor #22 wiring, but the twist-per-foot of the cable is tightly controlled to maintain the transmission line characteristics of the cable. 10Base-T uses a hub-and-spoke wiring topology as opposed to the

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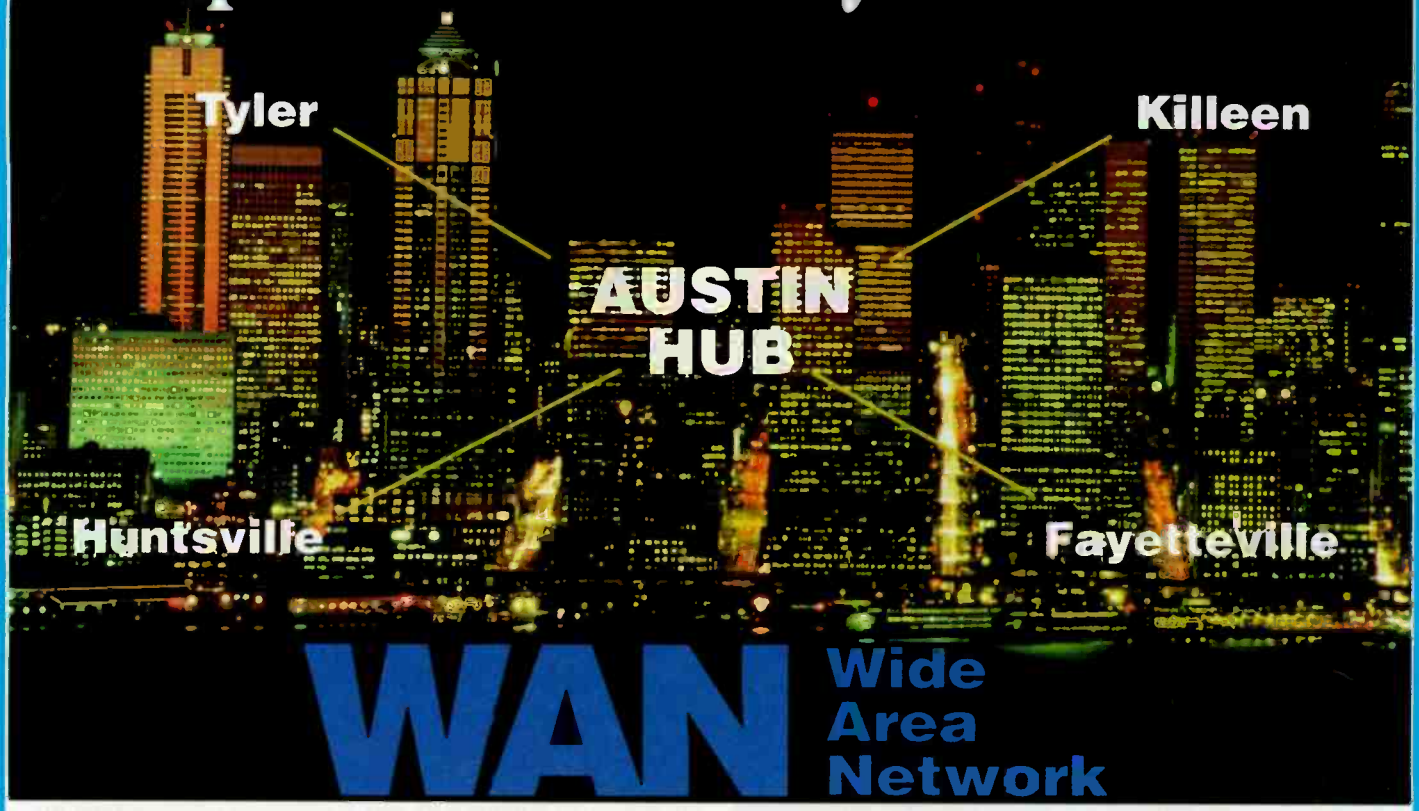

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daisy-chain configuration for thinnet. At the center of the hub is a concentrator. You can purchase a ten port concentrator these days for under $100.

To establish an intranet you will need an intranet server. From a hardware standpoint, just about any top-of-the-line desktop machine these days will work as an intranet server. Of course, you can invest ten times that amount or more for a system with redundant power supplies, backed up disks, and other features. It is possible to have computers talk to each other over a network in a peer-to-peer relationship without using a *central* server. While you can share resources (disks, printers and other things) this is not really considered an intranet.

Other resources

- *www.innergy.com/ifaq.html* — a collection of questions and answers concerning intranets
- *www.innergy.com/* — a webzine dedicated to intranets
- *www.intranetjournal.com/* — a journal that covers intranet issues
- *www.pathfinder.com/fortune/specials/intranets/index.html* — a high-level overview of intranets by Fortune Magazine

The other component is software. The software required will be determined by the services you want to support. Assuming that you want to provide typical Internet-type services, you will need to purchase a computer with an operating system like Windows 95, Windows NT or, if you are anticipating a very large system, Unix. You will then need to obtain server software to support the desired intranet services. Microsoft NT Server, for example, comes with a built-in web server application. You can also purchase separate server applications from companies like Oracle.

On the desktop side, you will need the appropriate networking software (Windows 95 and Windows NT have it built in). You will also need an Internet browser like Netscape or Microsoft Internet Explorer. Depending on your system requirements, you may need other software for utilities like mail programs or Telnet applications,

Connecting to the outside world

Once you have built an intranet, you will likely want to connect it to the Internet. It can be very easy to do so. All you need is a connection to an Internet Service Provider (ISP), and you are on your way. But remember this — if you connect your intranet directly to the Internet, you are asking for trouble. There are plenty of programs out there that will allow people on the Internet to access your machines directly and read, write — or worst of all — erase files from your hard disk. That is why almost all intranets that connect to the Internet do so through a *firewall*.

A firewall is a stand-alone computer specifically made to allow friendly traffic to pass, but to block any attempt by unauthorized users to enter your intranet. They may be a little expensive, but they can pay for themselves in a few seconds if you happen to run across the wrong sorts of folks.

Brad Gilmer is president of Gilmer & Associates, Inc., a technology and management consulting firm.

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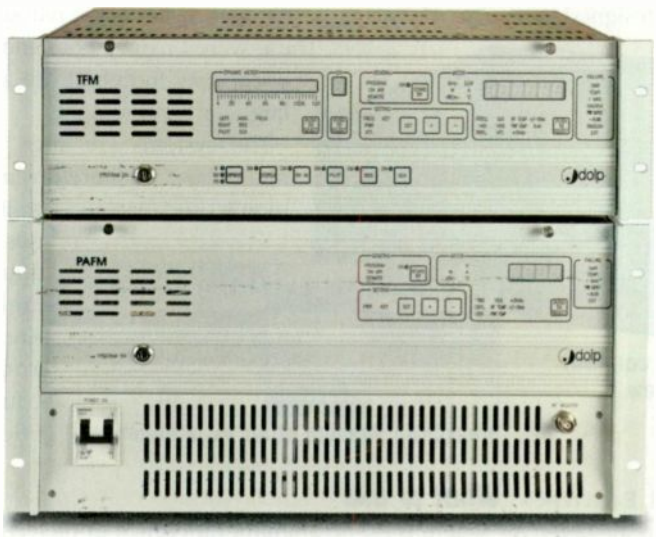

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Nitrogen vs. dry air

By John Battison, technical editor, RF

Radio transmission has come a long way since the days of Hertz, Alexanderson and Marconi, to name but a few of the pioneer users of transmission lines. These men did not have to worry about leaky lines or heavy, flexible pipes. Today's engineer is faced with different decisions. Rigid or flexible line? Solid or air dielectric? Nitrogen or dry air?

Why pressurize?

The main reason is to keep out moisture. It takes only a little water to cause changes in VSWR. If you get enough water in the line, there will likely be an arc-over.

Environmental decisions can influence your choice. Where is the transmitter located? How accessible is it year round? Is there a convenient facility for obtaining adequate supplies of gas? Transmission lines are designed to be airtight and are jacketed, but eventually connectors loosen, idiots with guns puncture transmission lines, and age acts to produce slow leaks. It's a good idea to maintain a record of gas pressure on each inspection trip. In more remote locations, dry air may be an obvious choice.

(Photo courtesy of Andrew.)

Air dehydrators

In general, air dryers or dessicators fall into two classes: automatic and manual. Each type basically consists of an air compressor and an air dryer. The dryer uses a dessicant (a chemical that absorbs water) to dry the air passing through it. There will often be an indicator that changes color with water absorption to determine the degree of freshness.

In the automatic mode two dessicant stages are used — one is in operation while the other is drying out. The transfer from one dryer to the other is made automatically by a timer or sensor control. Fresh air is drawn into the system and dried in one tower, then blown into the other tower (to dry it out) and also into the transmission line. This type of operation is more expensive than manual, but preferable. Manual operation requires regular inspection to check dessicant condition and to insert a new cylinder. Drying out cylinders may take up to four hours.

The manual system is of course less expensive than the automatic. However, regardless of which system is used it is essential that it be monitored so in the event of air pressure failure, remedial action can be taken immediately, before too much moisture enters the line.

Both systems use a pressure switch to maintain a constant line pressure of around seven psi.

Nitrogen cylinders and generators

Nitrogen, an inert gas, is normally used in pressurized coaxial cable systems. Recently, I have seen more small gas cylinders pressurizing coaxial lines than the old, tall, large cylinders. This may be because coax is holding up better and losing less gas now than before. The small gas cylinders are certainly less heavy to cart around, and cost less. A regulator is used to set the pressure level of the line.

An alternative to nitrogen cylinders is nitrogen generators. These were originally designed for higher-capacity industrial use and require large air compressors.

The systems are large, expensive and noisy, and therefore are not commonly used for radio installations. It is possible that if you share a multi-station site, the cost and space could be justified.

GAP (mm)	AIR (kV)	NITROGEN (kv)
2	7	8.5
6	19	20
10	28	30

Breakdown strength of air vs. nitrogen

What to use

There is no meaningful difference in dielectric strength between nitrogen and dry air. The assumption that nitrogen is better is based on comparisons of nitrogen under pressure with dry air at atmospheric pressure. When the pressures are the same, dry air and nitrogen are about equal in terms of peak RF power ratings.

Nitrogen does not support combustion. However, under high-energy conditions such as a lightning strike, nitrogen may form compounds with the insulators and change the performance characteristics of transmission lines. Oxygen in a dry-air system under similar conditions could also combine with the insulators and cause a system failure.

In a properly grounded transmission line, lightning energy is not directed to the internal parts of the transmission line. Systems containing Teflon insulator rings will char in a dry-air system during an arc-over, but will not support combustion and burn.

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Design engineering ** @ $100/h	400	800	2,000	4,000	400
Installation @ $40/h	120	240	240	480	40
Total costs	1,518	2,810	4,754	9,141	2,524
Total costs/yr	152	281	475	915	2522

*Dehydrator sized to compare with semi-automatic dual cylinder nitrogen system.
**Design engineering includes developing system requirements; design of system including hazard, space, etc.; hardware specifications; and supervision of installation.

Table 2. Non-recurring system design and installation costs.

Advantages of nitrogen systems

In the simple nitrogen system, external power is not required. In a fully automatic nitrogen system, electrical power is needed to operate the control module. Electricity is always required for a dehydrator.

A nitrogen cylinder system is passive and does not require a compressor, but nitrogen generators and air dehydrator systems do require one. Furthermore, cylinder nitrogen systems are completely quiet.

One last note: nitrogen does carry a safety concern. While it is not a poisonous gas itself, nitrogen can displace oxygen in a closed space and cause suffocation.

Advantages of air systems

Maintenance of a nitrogen system requires someone knowledgeable about the hazards posed. The person must be trained to handle heavy cylinders, know proper operation of the valves and regulators, and must be supplied with proper handling equipment.

Once installed, membrane dehydrators, which contain considerably fewer parts than other systems, require minimal maintenance and a skill level commensurate with changing an air intake filter.

In a large transmission line, it may take several cylinders of nitrogen to purge the system, or time must be allotted for a vacuum pump to evacuate the system. For a 300 cubic foot system, three to six cylinders are required for an adequate purge.

A nitrogen system has a fixed reserve volume, depending on tank capacity, at any given time. A leak in the system may empty the nitrogen tanks in minutes. At that point, moisture will enter the transmission line.

Membrane dehydrators are designed for cyclic or continuous running. In the case of a line problem or vandalism, the dehydrator will prevent moisture from entering the transmission line, though the optimum pressure may not be maintained.

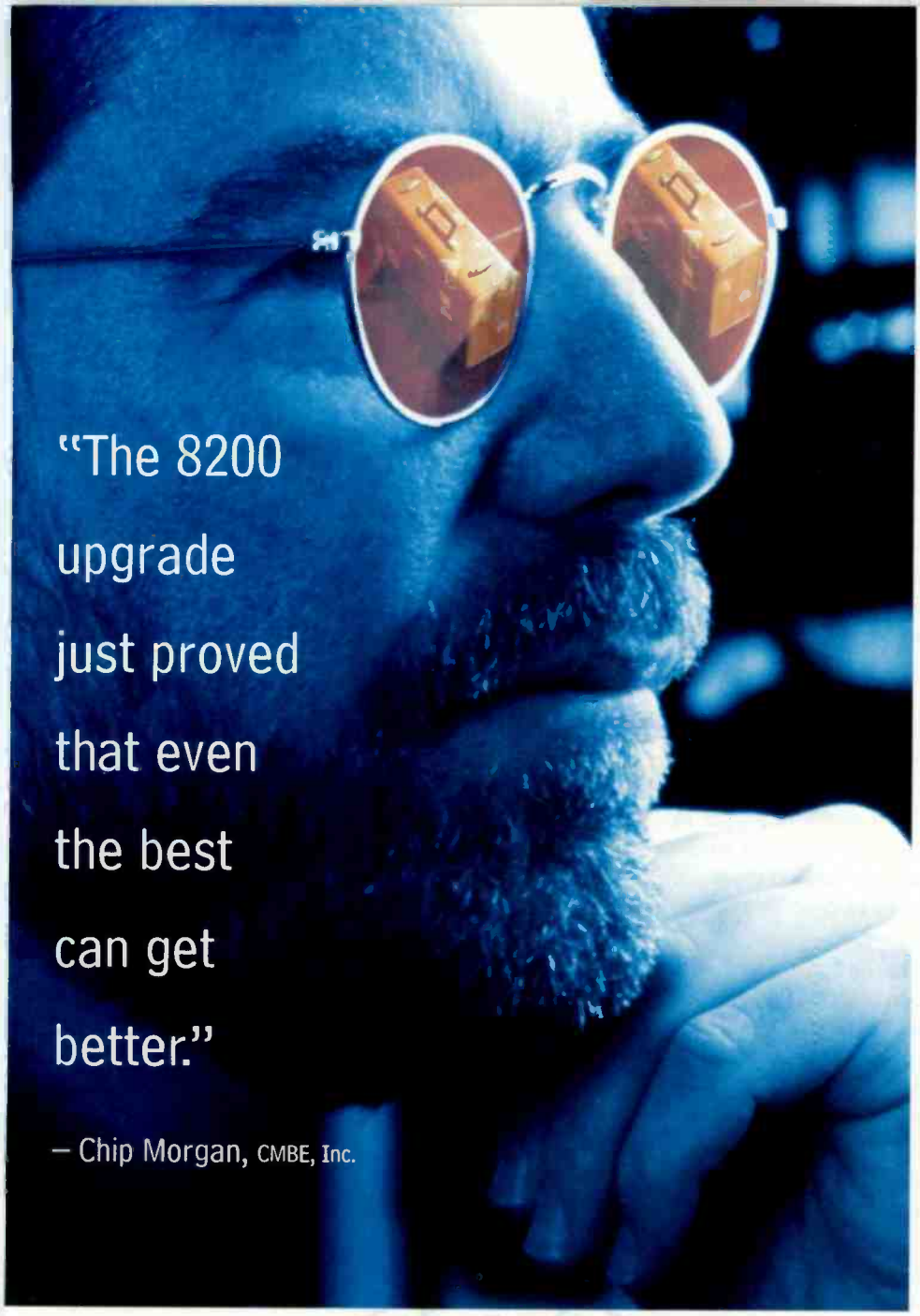
Comparative costs

Table 2 compares the costs of nitrogen and air dehydrator systems. All cost figures are estimates based on generally published manufacturing prices for equipment.

In any application where a pressurized transmission line is used, a dry air system is less costly, less dangerous, less space-consuming, less labor-intensive and less regulated than a comparable nitrogen system.

An assessment of needs and situations is necessary when any decision is made regarding transmission equipment, and pressurization method is no different. Careful assessment and consideration will lend itself to the implementation of a reliable system that best fits your needs.

Editor's note: *Information for this piece was taken from "Nitrogen vs. Air Pressurization" by Lloyd Keyser, from the July 1997 issue of our sister publication* Broadcast Engineering.



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IP Multicast: Radio of the future?

By Chriss Scherer, editor

The Internet is full of data waiting to be downloaded for immediate viewing or listening. The ability to send a continuous audio stream over an Internet Protocol (IP) connection is something that has been used by many stations, networks and content providers for some time. RealAudio/Video, Netshow, Audioactive and Xing technologies have made streaming audio something that is almost expected from a radio website.

Getting there

All the data passed over the Internet uses the *Internet Protocol*. A client (user) calls a server and requests the information, which is then sent back to the requester in packets of data. In the most basic application, a single client calls an audio stream from a server and creates a single, direct path. The data is passed to that client through that unique path. When a second client calls for the same stream, a separate, unique path is created to transmit those packets to the new client. This process continues until there is not enough bandwidth available from the server to accommodate the multiple IP streams that have been created. Many streaming audio software products will limit the number of listeners to avoid bogging down the system.

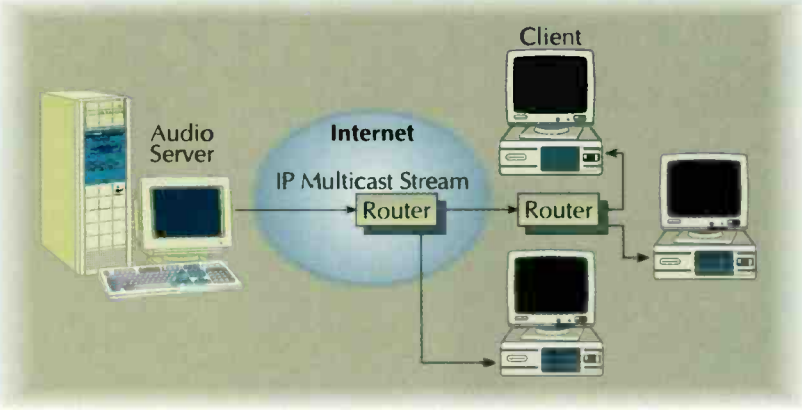
IP multicast changes the way audio streams are handled, distributing data in a fashion more like a traditional point-to-multipoint broadcast, like a satellite feed. Instead of multiple unique paths being created, the system can share points along the way and reduce the load of the originating server. As more clients call on the stream, the signal can branch out and become something like a crack in a car's windshield, with more branches being added as needed, but not having to originate directly from the source.

The boy next door

So far, we have considered a path from a client to a server as direct. That, of course, is not really accurate. Along the path from your PC to the server, there are multiple nodes being used. Each of these nodes will receive the data packet (from the server), decide what to do with it (in our case it's an audio stream), and then send it to its destination (the IP address for my machine). Suppose you and your neighbor both login and request the same audio stream. You both dial in to your ISP, which for this example we will say is the same. Once you are dialed in, the path to the audio server for you and your neighbor is theoretically the same from the ISP on. With standard IP, the server will be sending out two identical packets. Twice the bandwidth will be spent to get to the same point. With IP multicast, there will only be one path established from the server to your ISP, and then packets are sent from the router to you and your neighbor.

Pass it on

The demand for the audio stream is now no longer placed on the server, but really on the routers in the system. The current limitation is that most of the Internet backbone is not capable of passing IP multicast data. There are a few networks that claim full support, but you must be within those networks to take advantage of the technology.



IP multicast connections allow more clients and better net efficiency.

Since IP multicast can run over just about any network that can carry IP, putting it to work means making changes to the Internet infrastructure. The right routing protocols and setups can make it all happen.

There are several initiatives to get IP multicast capable systems up and running so everyone can take advantage of it. Other technologies can also take advantage of the protocol as well, not just streaming audio. Teleconferencing and many of the push services can feed point-to-multipoint data in a much more efficient manner.

Is IP multicast the medium for radio of the future? It's very possible. Radio over the air is a point-to-multipoint medium. IP multicast enables the Internet to be a similar point-to-multipoint medium. Instead of hundreds of carriers flying overhead, waiting to be grabbed by an antenna and receiver, now your modem gets pointed in the right direction to hear a newscast, football game or concert.

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FCC Update

FCC studies rule elimination

By Harry Martin

At a January 13 public forum, the FCC's Mass Media Bureau listened to proposals for streamlining application forms and processing procedures and for eliminating rules that are either unnecessary or overly burdensome. FCC Chairman William Kennard made opening remarks in which he pointed out that the 1996 Telecommunications Act requires the FCC to review all of its rules every two years. The January 13 forum was part of the agency's first such biennial review.

Among the proposals presented to the Commission by members of the audience were the following:

• Automation of call sign assignments — It was suggested that call sign assignments could be made through a reservation system posted on the Internet. An eligible applicant could reserve its desired call sign by entering its current call sign or file number and taxpayer identification number. The assignment would become effective upon the Commission's receipt of the filing fee and the accompanying Form 159. Linda Blair, chief of the Audio Services Division, advised that this proposal already is being considered and will be implemented as soon as the necessary software is developed.

Kennard

• FM drop-ins — It was suggested that a petitioner seeking the allotment of a new channel to a community should be afforded protected cut-off status with respect to its application for the new channel if the petitioner can simultaneously propose the allotment of a second, equivalent channel to accommodate other expressions of interest. Absent such a system, it is unlikely channel allotment petitions will be filed because petitioners would, under current rules, have to face auctions once their drop-in proposals are adopted.

• Renewal holding period — The staff was urged to eliminate the four-month assignment application blackout policy under which action on station sale applications is deferred while the renewal application for the station is pending. The Commission was urged to end this policy in light of the elimination, in the 1996 Telecom Act, of the opportunity for filing competing construction permit applications specifying a renewal applicant's facilities. Without the threat of a competing applicant and the need to demonstrate "renewal expectancy," parties wishing to complete a transaction prior to grant of the renewal could do so.

• Delegated EEO forfeiture authority — The staff was urged to seek delegated authority to impose forfeitures for EEO violations of $20,000 or less without having to refer the case to the full Commission for a decision. Currently, all EEO forfeitures are imposed by the Commission itself, which delays action on the renewal applications of affected stations.

• Form Revisions — The Commission's staff reported that an effort would be made to come up with a single FCC application form through which a communications entity could receive approval for the assignment or transfer of all of its FCC-licensed facilities, whether they be under the jurisdiction of the Mass Media Bureau, the Wireless Bureau or other bureaus.

Federal Court Nullifies Casino Ad Restrictions

In December, the U.S. District Court for New Jersey found the federal law restricting casino advertising by radio and TV stations in New Jersey, which allows casino gambling, to be unconstitutional. Thus, New Jersey joins Nevada and other states in the Ninth U.S. Circuit that have been, at least temporarily, cleared to carry casino ads. Shortly after the New Jersey decision, the FCC issued a public notice acknowledging that it would not seek enforcement of the federal law in New Jersey pending final legal activity. The Department of Justice plans to seek Supreme Court review of the New Jersey decision.

While it appears that the federal restrictions — at least in states that allow casino gambling — will eventually be rejected as unconstitutional by the Supreme Court, DOJ is not relenting in its efforts to defend the law in the federal courts. Until the Supreme Court acts, stations in states other than New Jersey and those within the Ninth Circuit are still technically required to abide by the federal law, as well as any state restrictions.

dateline

Radio stations in Delaware and Pennsylvania must file their 1998 renewal applications on or before April 1, 1998.

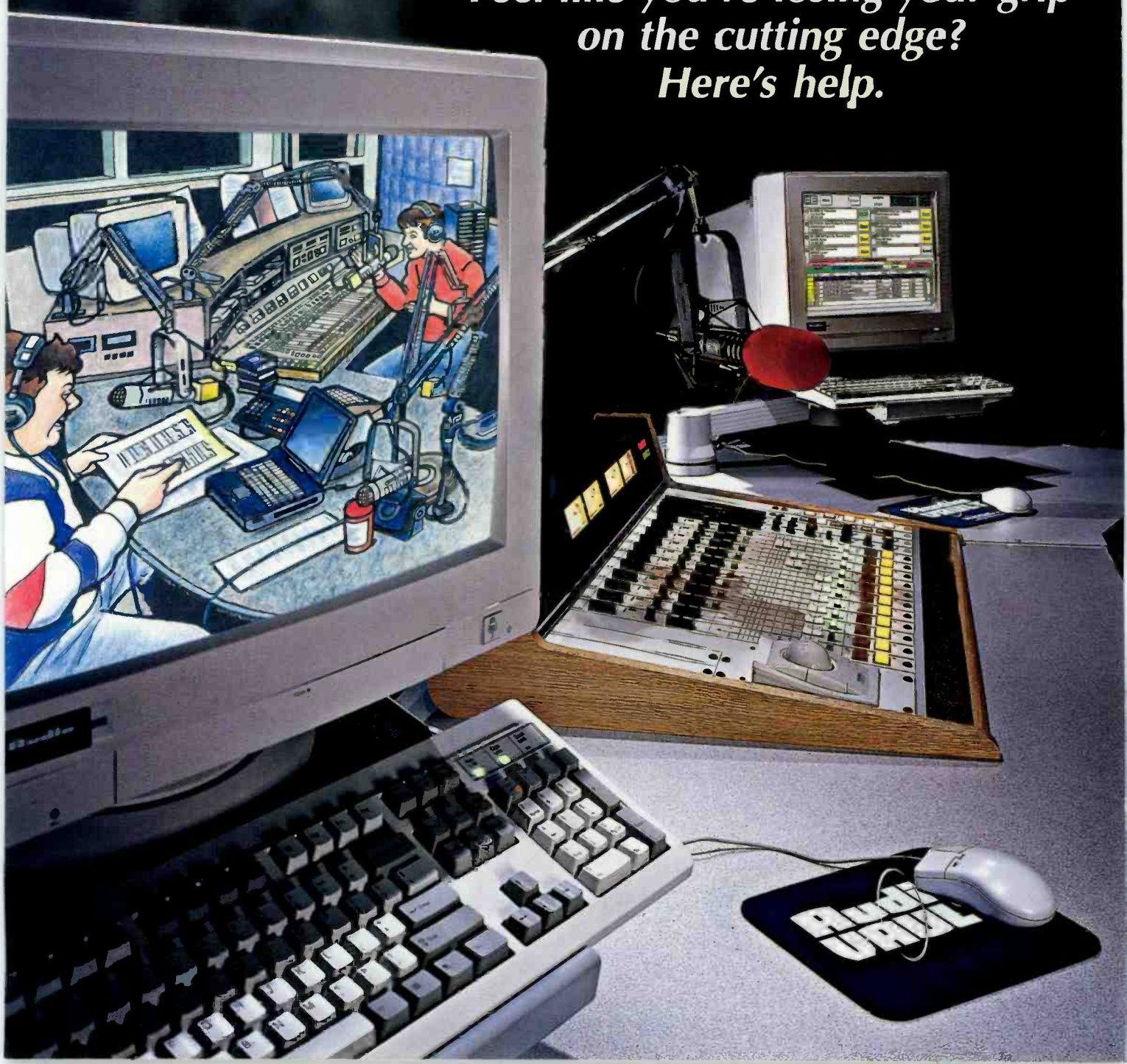
Commercial radio stations in the following states must file their annual ownership reports on or before April 1: Indiana, Kentucky, Tennessee, Texas, Delaware and Pennsylvania.

Tower owners in Kentucky and Tennessee must register their tower facilities during the period March 1-31, 1998. Towers in Connecticut, New Jersey and South Carolina must be registered during the period April 1-30, 1998.

An on-line radio primer

By Skip Pizzi, editor-in-chief

Feel like you're losing your grip on the cutting edge? Here's help.

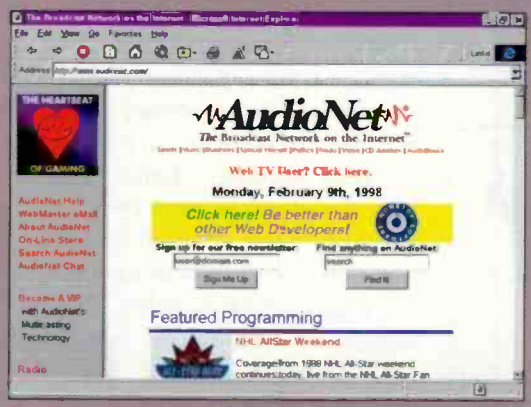


It's no secret that radio stations are flocking to the Internet. There's plenty of value for broadcasters to exploit in this new medium. But how to measure that value requires benchmarks that are as new as the medium itself. For this reason, the jury's still out on the level of investment in an Internet presence that's appropriate for a radio station today.

So it makes sense to take a hierarchical approach to the establishment of on-line radio service. That's how this article will explore the technology, as well.

Start with the basics

The first on-line step for broadcasters is essentially the same as any other business: Give yourself a virtual billboard on the World Wide Web. Start with a simple home page that reinforces your existing "brand," with your logo, format, and a statement of your attitude. Include ways to contact the station, including your e-mail address.



Audionet, based in Dallas, is an example of a content aggregator featuring on-line streaming audio of many types and formats. (http://www.audionet.com)

Then start building links to second-level pages. Probably the first of these should be a talent page. Include photos, bios or other appropriate statements and blurbs about each of the station's on-air personalities. You may want to include separate e-mail addresses for each. Talent need not respond to these, but it may give them a new way to check the pulse (or lack thereof) of the listenership.

Another page can cover currently running promotions, contests and other collateral material to on-air campaigns. Keep it fresh and timely. (This is where you start incurring an ongoing maintenance workload for the website, so make sure someone is charged with this duty as an official part of their job, and that they have the time and training required to handle the updating responsibilities.)

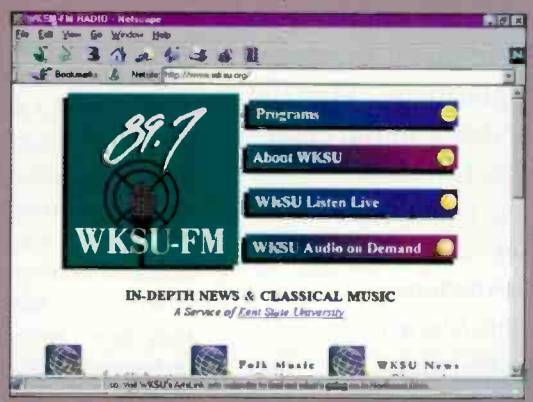
Once you start doing this kind of page, you'll begin to think of other timely items that can work in tandem with your on-air content. This is no small breakthrough. The synergy of on-air and on-line services can be powerful indeed. Once you have some good content on your website, send people there by frequent mentions of your URL (*Universal Resource Locator* – your "web address") on the air.

Serendipitously, the uniqueness of radio call signs makes it easy to have a nice, short, memorable URL (www.kxxx.com). Unfortunately, this does not apply to many stations' "promotional names," however. For example, another station elsewhere in the country (or the world) may have already registered www.Q102.com, meaning that no other station with that same promotional name anywhere else in the world can use that URL. So it pays to establish your website sooner rather than later, even if all you put up at first is a "placeholder" home page. (You can't just "reserve" a URL anymore without activating a site.)

Getting on-line

Unless you're lucky enough to already have an on-staff webmaster, start by working with an Internet Service Provider (ISP) and/or website consulting and design firm in your area. If your station is part of a large group, others in the group may have already established relations with such a firm or firms. Check with them first, but keep in mind that the geographic distance between server and user can affect performance (speed) of your website. Keeping the path shorter will subject your website visitors to less network clogging potential. Because most of your on-line users are likely to be located in your area, it makes sense to stay local with your ISP as well. It also allows more opportunities for mutually beneficial business deals between station and ISP.

The ISP will first register your URL with *InterNIC* (www.internic.net), the organization that administers website names. (Stations with in-house web experience can also perform this function themselves.) There is a nominal fee for this function, and it can take a couple of weeks to complete the process and get your new website name propagated to all the Internet routers. Once this is done, you're online.



WKSU-FM, Kent, OH, offers a fully featured station site that includes both live and on-demand audio in multiple formats. (http://www.wksu.org)

The biggest advantage of working with an ISP is that it minimizes your capital investment in establishing an on-line presence. You pay the ISP a monthly fee to carry your Web content on their server. You may even be able to work out a trade deal. Unless you design the original content yourself, you also pay a one-time fee to the ISP or a third party for the site design. Once you're hooked up with an ISP, work out a system whereby you can provide you own updates (more about this later).

Also make sure to check the website through a variety of browsers. The same HTML data (*Hypertext Markup Language*, the coding language of the Web) may appear on the user's screen in slightly different forms depending on the browser and its version.

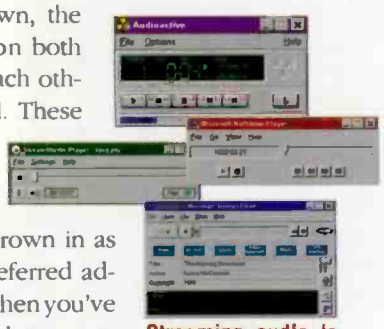
On-line radio

Value adds

Just as with your on-air service, a successful on-line strategy will consider listeners and advertisers, with creative ways to serve both groups.

One way to draw listeners to your site is to put useful civic information there, particularly of the kind that you would prefer not to run on the air. "Laundry lists" of information are good examples, such as concert calendars, ski or beach reports and even timely items like school closings. Keeping tabs on other community information can also fit here, like the current total of an ongoing local fundraising campaign, the dates of scheduled road construction projects or a list of speakers for the next few months' town meetings.

This kind of community information doesn't all have to be *pro bono*, of course. You can partner with local businesses (especially those who are already advertisers or don't have their own websites), to list pertinent information about upcoming events, like book signings or holiday specials. For companies that do have a website of their own, the information can be listed on both sites and mutual links to each other's pages can be included. These listings and links can be sold, traded or added to an on-air advertising package. Or they can just be thrown in as a goodwill gesture to a preferred advertiser — a helpful touch when you've just told them about the latest rate increase.



Streaming audio is becoming a radio Web site standard, but there are a variety of players. (Clockwise from top: Audioactive, Netshow, RealAudio, Xing.)

To stimulate interest among core listeners, a station can establish a "frequent listeners club" or similar process that encourages listeners to register themselves with the station. This can provide useful demographic information, as well as increasing listener involvement with the station. On-line contests can perform the same function. An inexpensive way to maintain the interest of all those listeners who sign up is an occasional group e-mail message with special announcements or promotions.

Like a print-based media company, broadcasters can resell or rent these "subscriber" lists to advertisers. But be sure to alert website visitors if you intend to do htis. A significant part of the on-line community still frowns on such traditional commercial practices, particularly holding their e-mail addresses sacrosanct from the dreaded "spam" (junk e-mail).

On-line advertising

Banner ads and links can actually produce some revenue from your website, as well as directing additional on-line traffic to your advertisers' sites. While you may not derive tremendous profits from this right away, it could be used to add a small increment to existing on-air advertising contracts, or simply to hold a competitive edge.

More advanced processes can leave *cookies* with users who visit the site, and the station can agree to deliver hit reports to

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advertisers with the e-mail addresses of all who visit the site or click on certain features. As noted earlier, these functions remain somewhat controversial. If mishandled, they can actually generate more ill will among listeners than whatever revenue they produce might warrant, so step carefully in this area.

If you want to pursue advertising on your site, it's a good idea to consult with an on-line marketing firm for recommendations and perhaps the design of these components of the site.

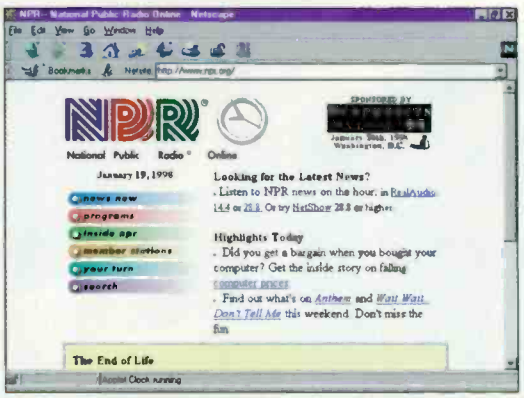
On-line audio

The next big step is the addition of streaming audio to the website. Since radio stations' primary product is audio programming, this seems only natural — perhaps more so than for any other type of business website. But there are several difficult issues to consider.

First, it's tempting to simply put the station's air signal on line, as several hundred radio stations have already done. Although audio quality is not up to FM standards (due to the heavy data compression required for streaming audio to 14.4- and 28.8kb/s modems), "webcasting" does give the station access to a much wider — literally global — listenership. Specialized audio processing can help the audio signal sound a bit better (see "Processing On-Line Audio," p. 42). On-line listeners around the world may tune in if they know your URL. The service also may be of particular value to *expatriate listeners* (devoted former listeners who have moved away) or part-time residents (like college students or retirees) who want to keep up with things back home.

But within this lies the paradox of webcasting. The transmission of a live audio program stream on the Internet as a point-to-multipoint ("broadcast model") service is considered anathema and a waste of bandwidth by the on-line hard-core. To this community, the Internet should be used for discrete, point-to-point communications of an interactive form, not simply for hooking up a lot of passive users to the same, non-interactive source. Trying to turn the Internet into a broadcst environment is inappropriate and regressive, according to these guardians of the Web.

There's more than just a philosophical argument to this issue – technical and legal obstacles exist, as well. In a way, the on-line environment is one that actually discourages mass listenership to real-time programming. Unlike broadcasting, where the number of listeners currently tuned in has no effect on performance of the system, a webcast that pulls big numbers can slow down and even crash its originating (or a distributing) server from overload.



NPR's website includes on-demand audio in both RealAudio and Netshow formats. The latest hourly newscast is posted to the site just after it airs. (www.npr.org)

There are also differences between broadcast and webcast regarding copyright issues. This is yet another area where technology has outpaced regulation, and it is somewhat convoluted. First, recall that there are several different types of rights involved with the distribution of published music. Primary among these are composer royalties (payable to songwriters) and performance royalties (payable to recording artists). Radio stations currently pay an annual fee to ASCAP and BMI (and in some cases, SESAC) for composer airplay royalties, but are traditionally exempt from paying artists or their music publishing companies any fees for the right to play the recordings of these songs on the air. (The legal argument assumes that record sales generated by such airplay are sufficiently valuable as promotion, so these rights are waived. This also assumes that each station's airplay is limited to a single market or region determined by its broadcast signal coverage.)

It is already possible — and relatively inexpensive — to obtain on-line distribution rights for composer royalties from ASCAP and BMI today. But the exemption from performance royalties that on-air broadcasters enjoy is as yet *not* guaranteed for on-line broadcasting. Regulation of this issue is still unsettled, and the argument that on-line distribution is significantly different from on-air usage — in technical, coverage-area and customer access terms — may be compelling enough to warrant separate regulation. Although no fees for performance rights are currently being levied for on-line music broadcasting, some observers believe this is only a temporary condition, and soon this additional burden that on-air broadcasters have never paid may be required of on-line broadcasters.

For this reason, many broadcasters (particularly larger entities and networks) are limiting their webcast audio to those elements that they own outright (i.e., original or "locally produced" programming), or original programs from affiliated stations, networks or producers that have been explicitly approved for on-air *and* on-line use.

Alternatives to webcasting the air-signal

These technical and regulatory reasons argue for an alternative to webcasting the on-air program. There also may be significant business value in creating separate on-line audio content. Although it may take a bit more work than simply repeating the air signal, a number of such alternate opportunities for on-line audio can leverage and re-purpose the existing assets of a radio broadcaster.

One such application is a *second service*, an alternate broadcast stream assembled from the same or similar cache of content that the broadcaster

Continued on page 38

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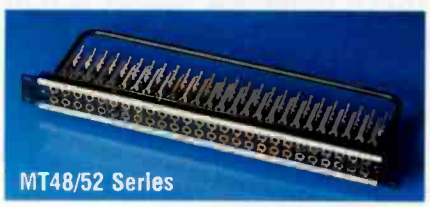

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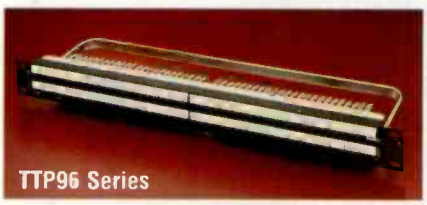

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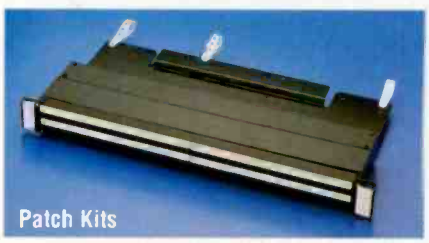

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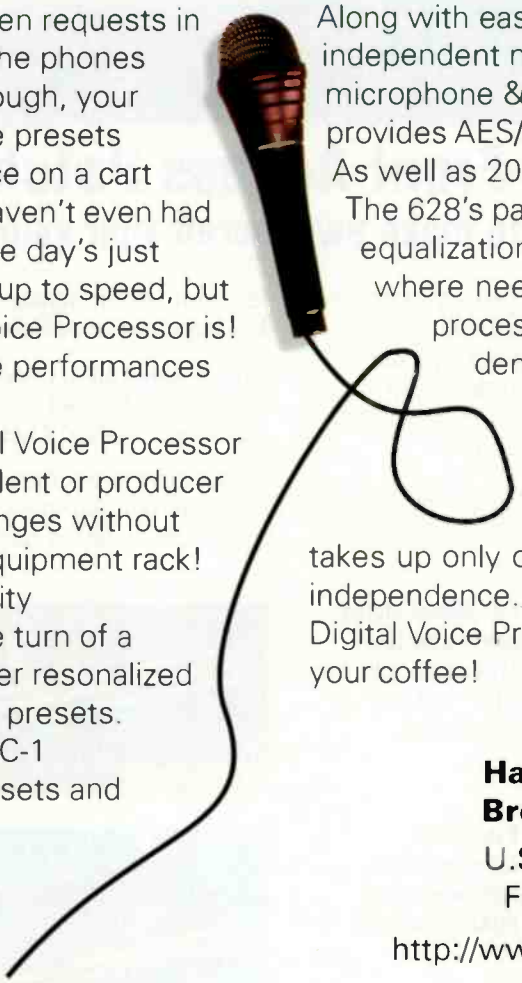

Along with easy plug to play operation, independent metering process functions, microphone & line level outputs.The 628 provides AES/EBU and S/PDIF digital outputs. As well as 20 bit A/D & D/A converters. The 628's parametric approach to equalization allows cuts & boost exactly where needed and provides sound signal processing every professional demands!

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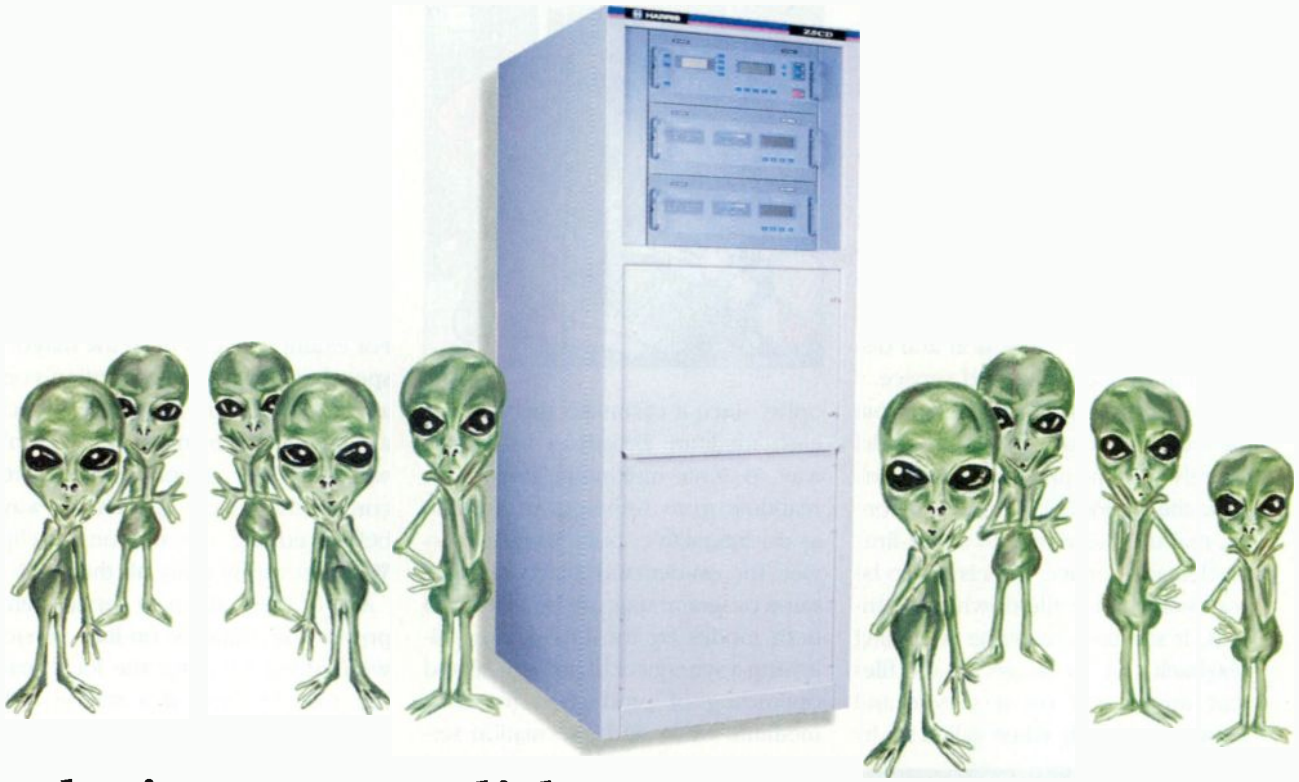

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On-line radio

Continued from page 32

uses on air, but avoiding any audio with questionable webcast rights. This second stream might also be "de-localized" to make it more appropriate for the general (i.e., non-expatriate) on-line listener. In today's consolidated context, such a de-localized service could also be shared and/or jointly produced by multiple stations of a group, thereby diluting its incremental cost impact to each of the participating stations. The digital automation systems that many stations and groups use today lend themselves nicely to the creation and distribution of such a second service.

Another approach moves away from the real-time broadcast stream model entirely to an *on-demand* model. Here the station supplements its on-air, real-time service with an on-line, on-demand service. This is not to be confused with a file-download process. It still uses real-time streaming playback, but for discrete audio files that are stored on a server and streamed out only when called for by the individual user, rather than played as a live, continuous program feed to the entire Internet.

There is great elegance to this philos-

ophy, since it optimizes the value of each medium: broadcast as a one-way, point-to-multipoint service for real-time mass listening, vs. on-line as an interactive, point-to-point service for on-demand playback. The same programming can be offered in both modes by the broadcaster, allowing a synergy of brand appeal and optimizing of production for each medium. News and information services are perhaps best suited to this dual approach. For example, an original newscast or story can be broadcast live on the air according to the station's predetermined program schedule, while a recording of the same newscast or story can be stored on a server and called for by individual web listeners as they demand it.

A more advanced approach is the "tell-me-more" scenario, in which a short form of the program appears for the general audience on-air, with a longer and more detailed version for the specialist community on-line. For example, a clip from the mayor's speech might appear in a station's on-air newscast, with the entire speech available on-demand at the station's website. (The station probably recorded the whole speech anyway, before editing out the on-air clip. Why just throw away all the rest?)

Any of these alternate services empower the station's on-line service with added value for the local market. Consider that if a station only repeats its air signal on-line, the value

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MP-3-5	5	3,000W	4.1	$2,270
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GP-3	3	6,000W	1.5	$1,900
GP-4	4	6,000W	3.4	$2,600
GP-5	5	6,000W	4.3	$3,150
GP-6	6	6,000W	5.5	$3,700

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SGP-2	2	8,000W	0	$2,690
SGP-3	3	10,000W	1.4	$3,595
SGP-4	4	10,000W	3.3	$4,500
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to the station's primary (i.e., local) market is minimal beyond a bit of novelty appeal. Real value is only offered to listeners outside of the local area, and these do not fit easily into the station's existing marketing schemes and business plans. On the other hand, a viable second service (either real-time or on-demand) can be sold and promoted to the local market much more easily and efficiently, and will draw exclusive users.

The success of such a "quantitative" model has been proven in familiar examples from the past. Consider that FM radio languished for years when it was just another way to get the same material available via existing AM radios (and it was at a *higher* audio quality). But once separate programming began on FM, the band took off, eventually eclipsing AM as the predominant audio broadcast medium.

This "synergy of separation" is enhanced by a station's ability to promote its on-line service with on-air announcements. As noted earlier, a webcast is only of value to those who know the URL. Local listeners can be made aware of a station's URL in frequent on-air announcements, as well as in any of the station's collateral marketing campaigns (print, billboards, TV, etc.). This is an advantage that most website owners do not possess. In fact, some station sponsors are already implementing this synergy by including their own URLs in broadcast ads.

An on-line pioneer is KPIG-FM, Freedom, CA (near Santa Cruz), which uses the StreamWorks audio format from Xing Technologies. A highlight of the site is a "live" video image of the DJ (the HamCam), captured every 60 seconds. (www.kpig.com)

Technical issues

Streaming audio technology is still relatively new, although maturing quickly. The speed of its change comes from the nature of computing and the workings of on-line economics. It's easy to distribute and upgrade a new on-line audio player because it is a *software* product, available for all popular computing platforms (in most cases) and downloadable or upgradable within minutes. The fact that the players are generally distributed free also helps a lot. These attributes allow most streaming audio players to enjoy a fast path to relatively high penetration levels among on-line consumers.

Also unlike traditional hardware systems, a number of different streaming audio formats can coexist in the market, because a single computer can be simultaneously loaded with several players, each serving as independent helper files or "plug-ins" to the web-browser software. Once the players are on board, the browser "automagically" calls the required player to decode the file. This situation is still a bit complex for the non-technical user, however, and it is expected to be further streamlined in the near future. The next generation of Internet browsers process will likely include a streaming media layer that will handle the decoding of multiple formats without requiring initial player downloads or exposing separate players during Web listening.

One hardware limitation that does exist for on-line listening is the computer modem. This problem is further confounded by the simultaneous deployment of a range of modem speeds, making compatibility difficult. While the majority of on-line audio users today use a 28.8kb/s modem, a large number of 14.4kb/s modems are still in use, along with a growing number of ISDN users (at 56- or 128kb/s) and intranet listeners (where rates vary, but typically hover around ISDN speeds). Many recent modems are actually capable of 33.6kb/s, upgradable to 56kb/s downloads, but these speeds are yet to be widely implemented among ISPs. Naturally, the on-line listening experience differs widely across this range of users.

One way to address this variety of connection speeds (at least in the short term) is the use of multiple encoding rates for on-line audio streams. This is why some on-line audio is encoded at two or three different rates or forms. For example, a live radio stream might be offered at 8kb/s in mono, 20kb/s in stereo and 40kb/s in wider-bandwidth stereo. An on-demand music file may be stored at 20kb/s in mono and 96kb/s in high-quality stereo. In some cases, an on-line audio service with two formats may use a separate encoding system for each (e.g., *RealAudio* at 10kb/s and *Netshow* at 20kb/s). Some services allow multiple speeds to be included in the same stream, such as a short 8kb/s speech-quality promo or introductory spot followed by a 20kb/s stereo music program.

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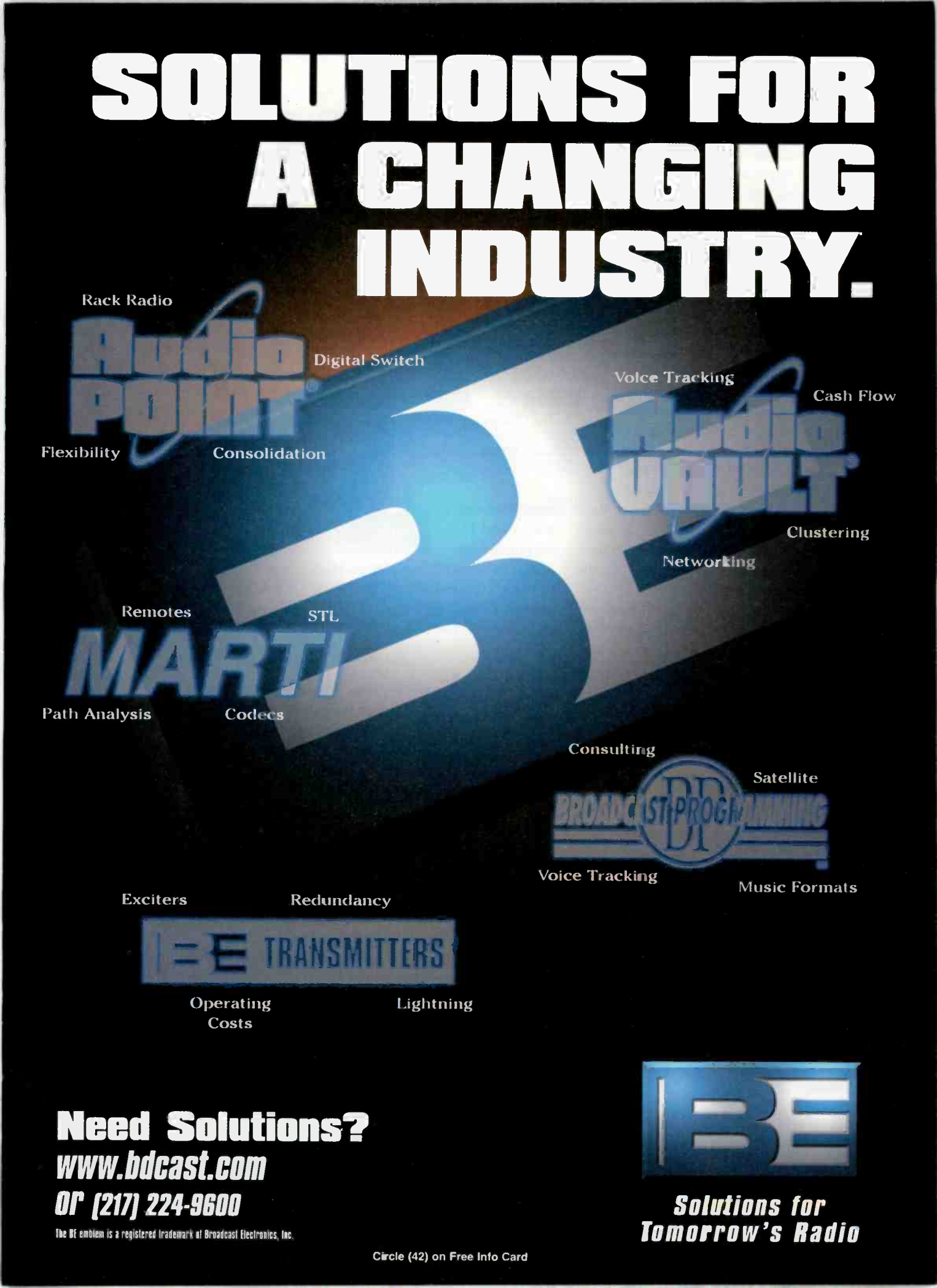

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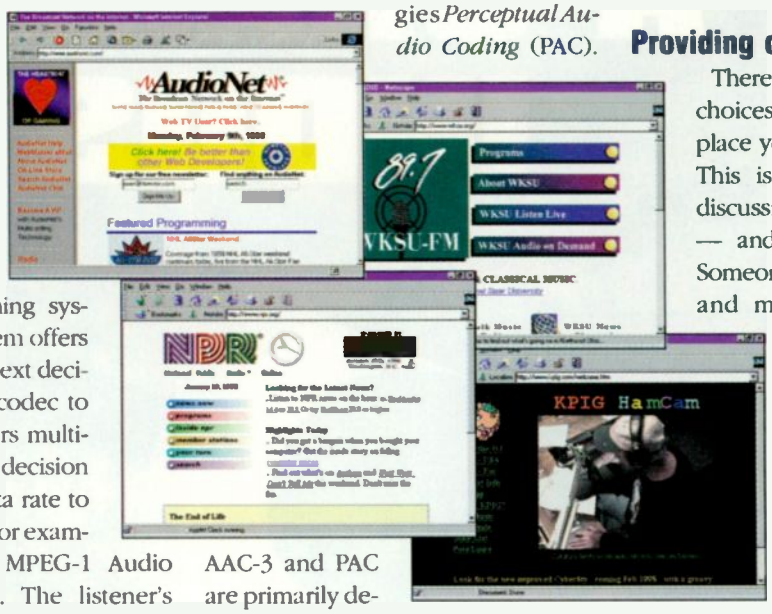
On-line radio

Each of these streaming audio systems includes two major components: 1) One or more audio compression algorithms (called "codecs"), each of which typically operates across a range of data rates. 2) An encoding format that streams the compressed audio data into packets that can travel on the Internet at or near real time. The webcaster must first decide which streaming system to use. If the system offers multiple codecs, the next decision involves which codec to use. If the codec offers multiple data rates, the last decision determines which data rate to use when encoding (for example, *Netshow* using MPEG-1 Audio Layer III at 16kb/s). The listener's player transparently adapts to the codec and rate selected.

New codecs under various stages of development will further improve the fidelity of on-line audio at the very low bit rates that it requires. These include MPEG-2 *Advanced Audio Coding* (AAC-3), MPEG-4 *Parametric Coding* and Lucent Technologies *Perceptual Audio Coding* (PAC). AAC-3 and PAC are primarily designed to deliver CD-quality audio at ISDN rates (64- to 128kb/s), but can be used at lower rates for good quality audio, as well. The draft MPEG-4 standard specifically addresses multimedia applications, and its Parametric Coding is designed for very low rates, optimized for either speech (2- to 6kb/s) or music (2- to 16kb/s) content.



Providing on-line service

There are also a number of choices on how to physically place your content on the Web. This is where all this virtual discussion gets frighteningly real — and potentially expensive. Someone has to own, operate and maintain the server on which all this on-line content resides, and someone has to pay for its connection to the Internet backbone.

As mentioned earlier, the easiest and generally cheapest approach involves the use of a local ISP for serving your on-line content to the world. This is often a good way to get your feet wet, and it's the method that many stations use

in their first forays into the on-line world. The broadcaster simply provides HTML files to the ISP, and, if audio is included in the service, sends a live audio stream via ISDN or equivalent (for a specialized on-line audio feed) or sets up an off-air receiver at the ISP site (if the air signal is used). Updated HTML files can be e-mailed to the ISP as they are produced. The ISP usually charges a modest fee to the station for this service, as it does to host any other customer's website, with the fee schedule based on the storage capacity required. In some cases, site design can also be negotiated as a service from the ISP. Often, the value of the station's content brings enough traffic to the ISP that it may be interested in discounting these services. Alternatively, a tradeout may be negotiated in lieu of cash for the ISP's services.

The potential downsides to this approach include the promptness with which your updates are actually posted (some ISPs are much better than others in this regard) and the capacity of the ISP's Internet interface. When the ISP is carrying a lot of traffic, listeners may have a hard time getting through to your website, or the site may seem to operate very slowly. If audio is involved, this may cause dropouts or other glitches.

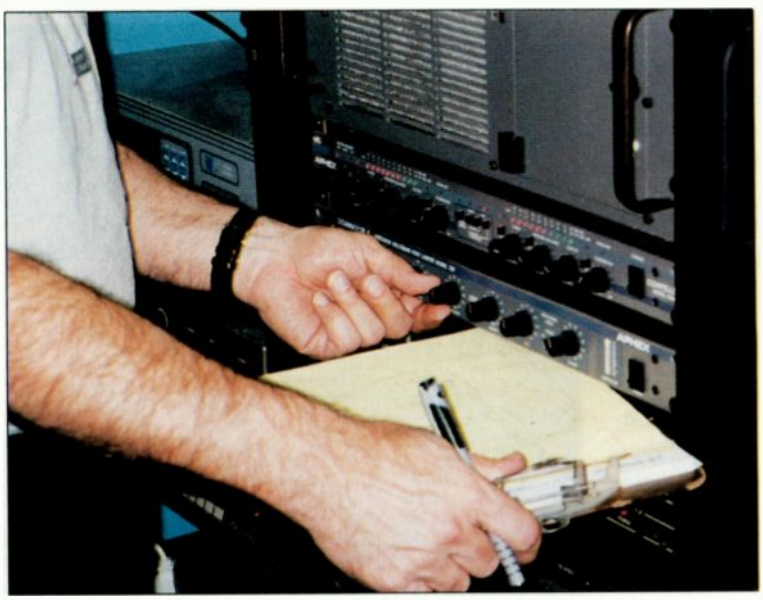
Should this become a problem, the broadcaster may elect to bring the on-line server operation under its own roof. This involves significant investment for the purchase of server hardware and the direct connection to the Internet (typically using a T-1 or faster interface from local telco). Monitoring the service's activity will tell the broadcaster when expansion of server space and/or interconnection bandwidth are required, incurring further expense. Maintenance of this hardware will also be the station's responsibility. Nevertheless, the station will be in full control of its on-line destiny (just as it's used to being for its on-air presence), with no third party standing between the station's content and the Internet.

To reduce the cost burden of operating its own on-line servers, a consolidated group of stations can share the facility. This can even apply to stations that are geographically separate, by using the Internet or private connections to deliver distant stations' content or updates to the shared server. (Stations that are really adventuresome can even expand into the ISP business, renting excess server capacity to advertisers or other local businesses and individuals – if the broadcast business doesn't provide them with enough challenges on its own.)

Another way of reducing overhead burden for an individual station's on-line service – and increase its traffic – is to join a *content aggregator* (such as *Audionet*). These services act as shopping malls, providing a single location where on-line audio seekers can come to select from lists of stations and other live and on-demand audio sources. This follows the new *portal* model of Internet access, in which on-line users consistently log onto a favorite default (or *home*) site

(continued on page 66)

PROCESSING ON-LINE AUDIO



Your air signal has a signature sound. Shouldn't your on-line audio stream have one as well?

By Chriss Scherer, editor

Audio processing is a part of running radio, regardless of the format. It has be come the signature of your station and there are hundreds of secret tweeks to get that distinctive sound. Whether you are running the latest "Turbo Tornado" box or a few hand-selected pieces of equipment, the sound you create becomes an integral part of brand recognition.

You make your air signal sound distinctive and take great pride in it. Why not apply the same philosophy to your on-line audio stream? The variety of sound cards and speakers is as diverse as the number of radios, and your on-air efforts are made to optimize your signal. Likewise, processing streaming audio can create an identifiable signature for listeners.

Processing fundamentals

The basic building blocks of an audio processor used for an on-air application can be carried over to netcasting as well. Some of the elements are not used for obvious reasons, like a stereo generator. A peak limiter can be used, but in the case of netcasting, it will serve the function of protecting the A/D converter.

By careful use of compression and limiting, you can enhance the quality of your on-line audio. The important thing to remember is that on-line audio is made possible by some hefty data compression. The encoding algorithms used reduce the bit count by throwing away some of the data our ears (supposedly) can't hear. If the audio processing is aggressive and

the resulting audio is dense, the algorithm won't be gentle with the audio.

Many stations currently netcasting are doing so by feeding a tuner directly into the net encoder. This will get you on the Web, but the audio processing you use on the air has been set up as part of a system that includes your transmitter and STL. The careful process of making a signature sound come alive is based on these parts. The only common elements of your air and net chains are in the control room. The rest of the on-line system should be chosen for the best sound over the given transmission medium.

The key is to consider your netcast as a separate part of the station — almost an entirely separate station. If the content of your on-line audio is the same as that of your broadcast audio, then take the audio from the output of the control room and treat it with the same attention to detail as if it were the audio being broadcast over the air. You can do this with separate processing.

The amount of processing you apply should be carefully selected. The same basic building blocks will be applied as an on-air processor. A pre-processor AGC or leveler will start the chain to smooth out some level mismatches, a multiband processor will follow. Some sites are using two-band processors with good results, while others have gone to three- or four-band processors for greater control. As always, the determining factor will be your own ears.

Any peak limiting will serve to prevent the A/D converters from being overloaded, acting as a safety net for anything that may pass through the system.

On-air and on-line

Some radio stations have gone on-line quickly by simply feeding a tuner into their net encoder. While this seems like a fast and simple way to go, you have placed not only your entire on-air audio chain in the path, but also the STL, transmitter and receiver itself. If your goal is to have audio on-line, you've made it, though some clarity and presence will undoubtedly be lost because of the long signal path.

This approach is also supported with the reasoning that there is relatively little income being generated from the on-line feed, so there is almost no cost justification.

Survey some sites on the Web distributing audio this way and the effects of the transmission path can be heard as multi-path, IM distortion or interference. Poor reception is also possible and very likely. If you are feeding the netcoder with a tuner, take the extra step and install a good antenna on the system.

The detriment to audio taken from a tuner is the pre-emphasis. By boosting the high frequencies and passing them through the system, they have been so heavily manipulated that the encoding algorithm will wreak havoc on them. In the analog world, it's possible to get away with this, but once digitized and encoded, the high frequencies are more difficult for the encoding algorithm to work with.

Superadio Networks

Location: Southborough, MA
Coding: Audioactive, Shockwave, NetShow
URL: www.superadio.com
(listen at: http://www.audioactive.com/listen/)
Processing: Omnia.net

WIDB Radio

Location: Carbondale, IL
Coding: RealAudio
URL: www.siu.edu/~widb/
Processing: Aphex Air chain (Compellor, Aural Exciter, 720 Dominator II)

ON-LINE AUDIO

A different application

The final goal of processing audio for the Web is to enhance it for the listener, just as you would over the air.

WDUQ-FM
Location: Pittsburgh, PA
Coding: RealAudio
URL: www.wduq.org
Processing: Audio Designs Plus AGC

The biggest difference here is that, unlike on the air, there is no loudness war — at least not yet. Web listeners are tuning in to a specific site, so the perceived attraction of loudness that is so often placed on over-the-air broadcasts is not there. Button punching does not happen on-line, partially because selecting a streaming audio site can take 30 seconds or more to connect, buffer audio and then begin playing. The side-by-side comparison cannot be made.

WMJI-FM
Location: Cleveland, OH
Coding: Audioactive, Shockwave, NetShow
URL: www.wmji.com
Processing: Specially modified CRL APP-400 pre-processor, into an Aphex Dominator. A small amount of equalization is added to help on small speakers.

While the side-by-side comparison cannot be easily made on-line, there is still a question of audio quality. The feed from a tuner — with the aggressive station processing on it — may sound okay, but you will hear better results by tuning the sound for the online medium.

Each encoding algorithm will be processed differently. Other factors to consider when working with the processing are audio frequency response (sampling frequency) and data transfer rates. These differences will affect how you should make your adjustments.

In a multi-band processor, the controls that will help you get the best results are the band mix levels and crossover frequencies. The crossover frequency selection will be directly affected by the sampling frequency and data bit rate. By adjusting the crossovers to specific regions, you can fine tune specific bands that might cause problems to the encoding algorithm.

Adjusting the mix levels will set an overall tonal balance, but it may also serve to reduce a problematic frequency range. Consistency will be achieved with your audio processing, from one song to another, or from voice to voice.

Keep in mind the listening environment of the on-line audience. When you adjust the processing for the air signal, you probably make some compromises based on listening tests done on a boom box, in a car and on a good stereo system. The same is true for on-line audio. Most on-line listeners are using sound cards with some pretty average specifications, and a smaller pair of PC speakers. There are some systems that have higher fidelity components, perhaps even bookshelf or floor speakers driven by a quality amp, but that is not typical. Be sure to keep this mind when setting things up.

The Omnia.net from Cutting Edge has processing algorithms specifically designed for webcasting.

Bringing it all together

What processor will you use on-line? This decision will have several determining factors that are financial, practical and aesthetic. You probably have some retired audio processors available that could be pressed into service, and you might achieve satisfactory results with little effort. Or, you might try several units and then start adding some modifications to alter the sound, just as you may have done with on-air units.

WPLJ-FM
Location: New York City
Coding: NetShow
URL: www.wplj.com
Processing: A multi-band processor (name withheld, but affectionately referred to as the "Squash-o-Max 2000.")

No matter what processor you choose, the goal is not density and

loudness. Your Internet efforts should focus on clarity and quality. Minimize the artifacts of data reduction. This can be a very different philosophy than what is normally employed.

One unique approach comes from Cutting Edge Technologies. Last year they unveiled the Omnia processor, which is available as the Omnia.net. Built on the same hardware as the Omnia.fm processor, some of the unnecessary hardware (like the stereo generator) is removed, and the processing presets are optimized for on-line audio. This unique approach, directed at on-line processing, is interesting, and it is possible that other manufacturers of digital processors could release preset packages for their processors, much like the pro audio industry has done with the multi-effect processors having sound packages for guitar, drums or other specific applications.

In some ways, processing on-line audio is like the early days of radio broadcasting. The idea of processing audio was not thought of in the same way that it is now. By using audio processing on your on-line audio, you can optimize it for the best possible sound over the Internet.

Simple tricks

Most will agree that the biggest detriment to an aggressive coding algorithm is hard limiting and clipping. When setting up your online processing, keep this in mind. Again, there is no loudness war. Let's hope there never is. The effects of pre-emphasis/de-emphasis will also cause some problems, so direct (not off-air) feed is best.

WHTZ-FM - Z-100
Location: New York City
Coding: NetShow
URL: www.Z100.com
Processing: TC Electronic Finalizer (3 band processing and digital EQ)

When setting up a multiband processor, look at the crossover frequencies and adjust them for the best sound. Also, be sure to listen to the various transfer rates in use.

On Remote: Producing The Super Bowl For Radio

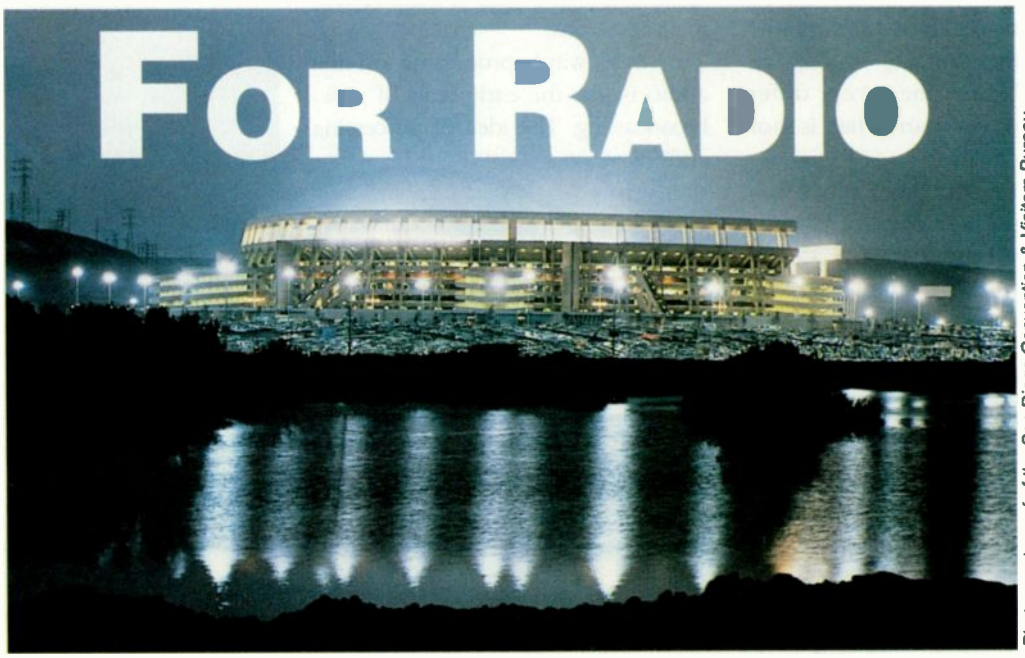


Photo courtesy of of the San Diego Convention & Visitors Bureau

A few hours in San Diego heard around the world

By Chriss Scherer, editor

January 25th was a big day for football fans. Actually, it was more than just a big day, it was *the* day for football fans. This year, Super Bowl XXXII was held at Qualcomm Stadium in San Diego. 68,000 people attended the sold out event to watch the Packers battle the Broncos. The task of carrying the event on radio was handled by CBS Radio Networks. Over 400 stations in the US and also the Armed Forces Radio Network carried the game live.

The satellite uplink was done in New York at the CBS facility, with audio sent from San Diego via ISDN. The feed contained audio from several sources at Qualcomm, including the announce booth, locker rooms, sidelines and field for the post game.

Putting all this together took time and careful planning which began about four months before the game. There are usually existing broadcast facilities at the stadium, so the ordering for any additional POTS or ISDN lines was minimal. This year's broadcast used the existing CBS lines and also an ISDN line from KFMB-FM, San Diego. An additional POTS line was installed for audio backup.

A facility walk through was done in the early stages to see what broadcast infrastructure existed and what needed to be added. Additional lines were installed a month before the game. Because of the advance planning by the stadium, there was not much that needed to be rushed for game day. Adding some dry pairs (audio wiring that is not amplified or equalized) to a few locations throughout the facility was done for additional flexibility.

ISDN has been used extensively for football broadcasts for the past three years. Prior to ISDN, switched 56 equipment was used. Before that, all the backhaul was carried out over satellite. ISDN's increased availability has improved sound quality and reliability, in addition

to greatly reducing production costs.

One of the most important pre-show arrangements was contacting the local frequency coordinator. Coverage of an event like this is a major undertaking and there are several groups covering it using a multitude of wireless mics, two-way radios, RPU and other methods for communication and program feeds. The frequency coordinator ensured clear communication paths for all the involved parties resulting in fewer headaches for the engineering staff.

On game day, Gary Baylor, Bruce Berenson and Dave Sniff (left to right) take a brief time out.

The signal chain

All primary broadcast audio was transmitted over ISDN to New York. Within the stadium, several dry pairs connected the announce booth to the locker room and field locations. The main audio control point was the announce booth, and everything either came into or went out of this room.

The announce booth ran on a Mackie 1402 mixer, with some Shure M-367 mixers used for sub-mixing. The Shure mixers could also have been reconnected to serve as a full backup system if the need had arisen. The announcers wore Sennheiser microphone headsets driven by Rane HC-6 and ATI HD1000 headphone amplifiers. The producer maintained communication with a Sennheiser headset microphone and a Gentner Micro-Tel interface.

For locker-room feeds, the talent was equipped with an Electro-Voice 635 microphone and a Shure FP11 and FP12 for microphone amplification and a headphone monitor. There were two separate audio feeds sent to the locker room. One feed was a full IFB for the talent to get cueing and monitor information from the booth. The other feed was set up for the interviewee, containing only program audio. It wasn't always done this way. Until a few years ago, only one IFB feed was sent to the locker room. A problem arose once when a producer, thinking that only the talent could hear him, passed an instruction down to the losing team's locker room. His

Super Bowl

instruction, "drop the loser, we have the winner ready," was a not well taken by the coach being interviewed. The separate mix allowed the announce booth to ask questions of the interviewee as well.

The single EV mic gave the talent complete control over the interview. With only one microphone, the interviewee does not need to hold a mic, and the interviewer can direct the interview more easily. Each locker-room setup had three dry pairs between the announce booth and the locker room.

A contracted sound company delivered three audio feeds — public address, referees and international sound. The international sound feed contained crowd and field noise for the ambience of the stadium. All three feeds were added in the submix and, once a balance was obtained, these feeds were left alone during the broadcast.

After the game, broadcast of the trophy presentation ceremony used Samson wireless microphones. Dry pairs could have been installed for the filed feeds, but the wireless mics give more freedom of motion and adaptability to an unforeseen situation. The receivers were located near the announce booth with the antennas in clear view of the field. Even with the careful placement, engineers can easily foresee problems that may arise with the number of people on the field for the winner's ceremony.

During the ceremony, there was a producer on the field carrying a modified cell phone with a Telex earpiece to communicate with the announce booth. The volume on the field gets to be overwhelming during and after the game. Without the earpiece, the phone would have been useless.

After all these sources were brought to the booth, the final mix was sent to CCS/Musicam USA CDQ1000 codecs with Adtran terminal adapters. There were two ISDN lines set up for main and back-up use. A third line was established using a Comrex Hotline and a POTS line in case of serious ISDN trouble. The POTS codec allowed a 7KHz backup feed in case of major trouble. It may not have sounded as good as a full-bandwidth ISDN connection, but would have certainly been better than a plain telephone connection.

In New York, the signal was received over a CCS/Musicam USA CDQ1000 again and distributed to the satellite uplink. Satellite delivery was handled on Satcom C-5 over a SEDAT channel.

Shure distribution amps fed the mix of the game to several locations within the stadium. A feed was provided to the NFL commissioners box, NFL control, some of the luxury suites and was also carried on the house PA so attendees could listen to the game while waiting in line for a hot dog.

ISDN advantages

Since a single ISDN connection has two bearer (B) channels and the game broadcast was done in mono, there was some additional capacity to be taken advantage of. The feed from San Diego carried the main program audio on the first B channel. This was routed to New York for the uplink. The second B channel was used for communication between the producer and the uplink site.

On the return side from New York, the first B channel carried a full IFB that was monitored by the producer and some of the talent. The second B channel carried a network mix-minus. This feed was distributed to the talent and mixed with the local audio for a full mix without any delays. Although the local producer gave cues to the talent, the mix-minus aids the talent up with what is going on over the network.

Using the second B channels for cueing meant one less dial-up POTS line, cutting some cost, but also helping to simplify the setup.

Technical Staff

The entire event was handled by a three-man team. A local engineer (based in San Diego) acted as the primary technician up until game day, covering all the planning and any needed installation. On game day their roles reversed and a third technician was added to help cover the remaining duties.

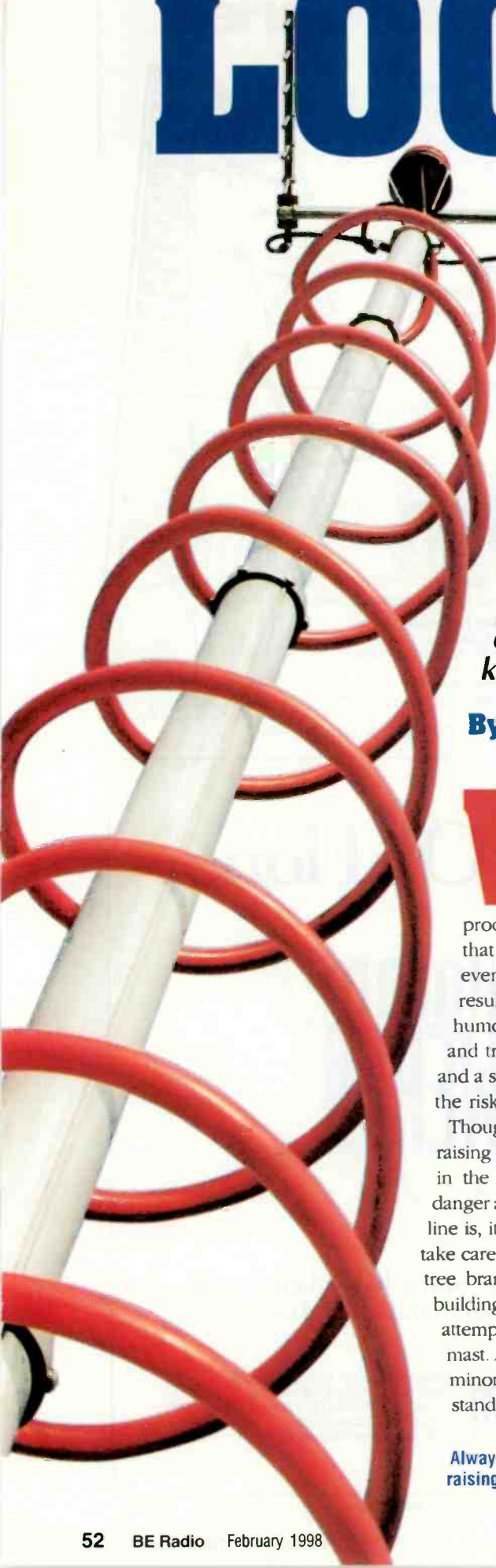
One technician was always at the main control point; the announce booth. After the game, the second technician headed into the winning locker room and the third went down to the field. They all carried two-way radios to stay in touch during the entire event.

Pulling off the Super Bowl broadcast is a major feat and there is no rest until it's over. As is always the case, planning was key to success. Adequate backup equipment helped to ensure that interruptions were minimal, if at all. With so many people listening, no interruption was acceptable.

After it was all torn down and the crowds have left the stadium, there was a moment to catch your breath and take it easy — and then look forward to Super Bowl XXXIII in Miami.

Thanks to Bruce Berenson, traffic manager, CBS Radio Networks and Dave Sniff, KFMB, San Diego for their assistance in the preparation of this article.

LOOK UP: A mast safety primer



Raising a mast can be one of the easiest parts of a remote, but also one of the most dangerous. What do operators need to know about mast safety?

By Jim Saladin, associate editor

With so much going on at a remote, it's easy to forget even the most fundamental elements of the production sequence. As such, safety, that of your equipment, your staff and even you, can be compromised. The results of a breakdown can range from humorous and embarrassing to expensive and tragic, but with a little extra planning and a small investment in safety equipment, the risks are easily diminished.

Though there are several concerns when raising a mast, clearance should be foremost in the minds of operators. As much of a danger as coming in contact with an overhead line is, it's not the end of the story. You must take care to look for any impediment — signs, tree branches, flags and banners, and even building overhangs. Also, you should never attempt to move a vehicle that has a raised mast. A deployed mast makes even the most minor of adjustments unwise from a safety standpoint. The risks run the gamut.

Always check for overhead obstructions before raising a mast. Photo by Chriss Scherer

Weather is always a concern. Lightning is an obvious danger and every effort should be taken to avoid situations where a mast is deployed in an area where strikes are likely. Wind can also become a factor. Except in the most extreme conditions, it is not likely that masts have enough surface area for wind to cause a van to tip. However, vehicles will rock, even in storms of moderate strength, causing the mast to move a great deal away from plumb in both directions. That brings into play obstacles thought to be safely cleared. Be aware that overhead obstacles remain a danger even after a mast has been safely deployed.

Take a walk

So, what are some simple rules for mast safety? Probably the simplest is also the most effective: look up. Before raising the mast, take a 360° walk around the van and make sure there isn't anything overhanging your mast's area of verticality. If it's a nighttime or early morning remote, take a flash-

light and shine it upwards. A good rule of thumb is if you see anything that looks as if it might be close enough, it is.

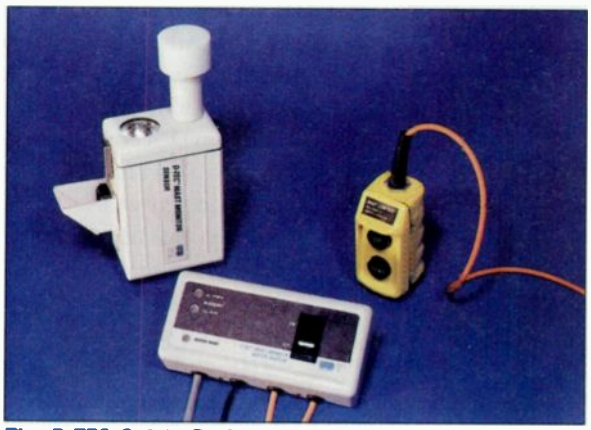
Another good suggestion is to sit down with your staff and work out a procedural checklist for remote set ups. That checklist should become the basis for regular, if informal, quizzes. As automation and push-button convenience continue to become pervasive in the industry, engineers, especially junior staff, need to know not only *how* procedures are done, but also *why* they are done. And even if you've done hundreds of remotes, it can't hurt to have a reference.

Lastly, allow time to think. Plan ahead for a remote and give yourself ample time to set up. Don't be in such a rush to get on air that you try to make the best of a bad situation.

There are also several products to help you toward a safe remote. The D-TEC Safety Package from Will-Burt includes a focused look-up light to illuminate the area above the mast, an AC detection system designed to electrically sense charged wires, and an anti-collision system to detect overhead obstruction in the path of the extending mast. The AC sensor simultaneously scans for exposed high voltage and, if detected, sounds a warning signal. If collision is imminent, the system puts out a loud audio and visual alarm signal and automatically stops mast extension.

The Sigalarm Power Line Proximity Warning System is an electronic safety system used for detecting the electrostatic field of any AC power line. It provides both audible and visual alarm warning signals to alert the operator and attendant ground personnel when the boom comes within proximity of an energized high-voltage power line. The entire length of the unit's sensor antenna continually receives the signal produced by all energized lines. The signal is amplified by the electronics on the main control unit, and its sensitivity controls allow the operator to set the alarm circuits to register at a predetermined distance from the power lines, producing warnings of increasing intensity according to line proximity.

Allen Osbourne Associates, the U. S. distributor for HiLoMast, markets a magnetic safety device that disables a vehicle's ignition while the mast is deployed, effectively preventing the danger of moving a deployed mast into an overhead obstacle. It employs a magnetic switch to complete the ignition circuit in the masts down position. If the mast is deployed, the circuit is broken, thus preventing movement of the vehicle.



The D-TEC Safety Package from Will-Burt features an AC sensor that simultaneously scans for exposed high voltage and, if detected, sounds a warning signal.

Just in case

Despite all efforts to the contrary, accidents do happen. It's good management and good engineering to be prepared for difficult situations. Toward that end, contact your local power company for training on what to do if your mast does contact power lines and how best to avoid tragic events thereafter. Furthermore, contact your local branch of the Red Cross for training in CPR and first aid. They offer regular workshops and might even be able to come to your facility to conduct classes.

New Products

MD recorder
Denon Electronics

◀ **DMD-1300P:** unit is equipped with Advanced Super Linear Converter (SLC) in order to maximize precision in D/A conversion and enable a natural, smooth sound, as well as eliminate zero-cross distortion by correcting errors during conversion; built-in sampling rate converter supports a wider range of sampling frequencies that vary according to the digital sound source; converter automatically detects 44.1kHz for MD and CD, 32kHz, and 48kHz for DAT in standard mode; A/D conversion unit is a fourth-order, sigma-delta A/D converter with 64x oversampling; unit boasts superior sound image localization with linearity and a high S/N ratio during reproduction all along the sonic spectrum.

973-575-7810; fax 973-808-1608; www.denon.com
Circle (201) on Free Info Card

Portable D/A monitor
Harris Corporation

▶ **Audio Bit Buddy:** belt-pack portable monitor allows checks of digital (AES3, S/PDIF) or analog audio signals; allows monitoring by headphone output while L/R levels are displayed on the LED bar-graph meters; critical signal parameters like sampling frequency, emphasis, professional/consumer format and data errors are displayed while monitoring AES3 or S/PDIF signals; digital input monitors sampling frequencies from 30kHz to 50kHz automatically.

800-622-0022; fax 765-966-0623; www.broadcast.harris.com
Circle (202) on Free Info Card

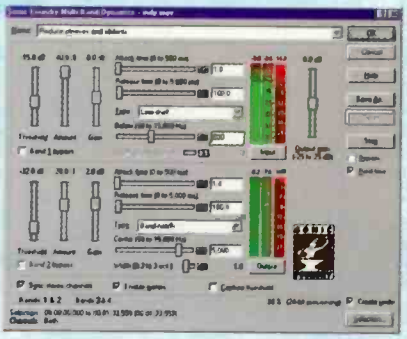
Mixer with built-in effects processor
Spirit By Soundcraft

▼ **Folio FX16:** a flexible four-bus mixer, the unit is capable of producing digital-quality sound for both live and recording applications; features a specially designed 16-program Lexicon effects section with dual-effect

capability (including chorus and reverb, chorus and delay, and reverb and delay), as well as fully editable/storable programs and parameters; console 16 mic/line inputs and 26 total inputs to mix, including FX returns and tape return to mix; in addition to the mix outs, two sub-busses allow groups of instruments to be sent to multitrack recorders or additional speakers, or sub-grouped to mix; the 16 direct outs are individually fader pre/post switchable.

916-630-3960; fax 916-630-3950;
www.spiritbysoundcraft.com
Circle (204) on Free Info Card

Audio plug-in pack
Sonic Foundry

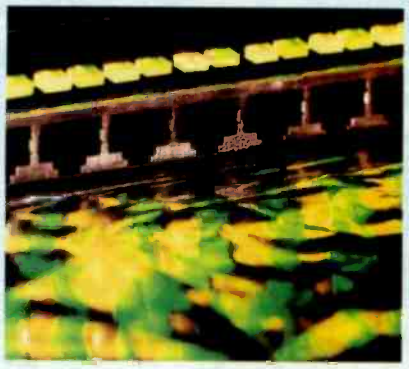


▲ **XFX 2:** capable of running on any program that also supports DirectX plug-ins, including Sonic Foundry's Sound Forge 4.0; package includes native versions for Windows NT-compatible systems (x86, Pentium and Alpha), and Windows 95; features real-time previewing of all effects for instant feedback and optimized editing sessions; includes Noise Gate, Graphic Dynamics, Multi-band Dynamics, Paragraphic EQ, Parametric EQ and Graphic EQ plug-ins.

608-256-3133; fax 608-256-7300;
www.sonicfoundry.com
Circle (203) on Free Info Card

Direct view indicators
Ledtronics, Inc.

▼ **PCB-1185 series:** low-profile in-line direct view indicators allow designers to mount LEDs over RJ-45 jacks without the use of light pipe



modules; mounted at a right angle, these LEDs are ideally suited as status indicators in modem and network (LAN and WAN) applications; wide-viewing, highly visible rectangular units are configured in blocks of two per housing, while each housing can be configured in colors including orange, ultra red or blue, or high-efficiency red, green or yellow; special order units in the series include super bright and/or bi-color LEDs.

310-534-1505; fax 310-534-1424;
www.ledtronics.com
Circle (207) on Free Info Card

New Products

Surge suppressor
New Frontier Electronics

▼ **SX115R/RT/RL:** housed in a magnetically shielded, single-rack-space enclosure; features eight standard grounded AC receptacles and improved EMI/RFI filtering circuitry; six receptacles may be switched on or off by the user via an illuminated rocker switch while two remain permanently on; a power LED lights up when the unit is plugged in and a self-test circuit and additional LED indicator assures the user that the unit is functioning properly; the RT model includes remote turn-on, while the RL model adds two front-panel connectors for Littlite gooseneck lamps; unit provides 15-amp protection, stopping surges of up to 6000V without production of ground contamination.

215-862-9344; fax 215-862-0270
Circle (208) on Free Info Card

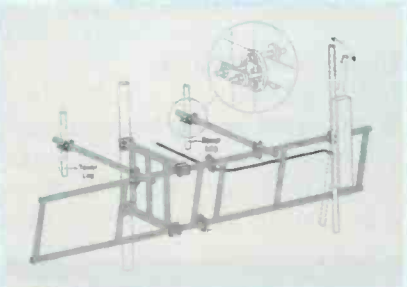
Echo eliminator
Avocet Instruments

▼ **Delay Canceller:** permits remote talent to use the air feed as their return audio from the station, freeing the remote from the requisite dedicated return path; uses a special DSP program to compare audio being transmitted to the studio with audio being received at the remote site via the on-air signal, satellite link or microwave path; as the unit recognizes transmitted audio in the receive path, it adapts to remove it, compensating and correcting for transmission delays of up to 800ms.

800-443-0728; fax 503-671-9626; www.avocetinst.com
Circle (209) on Free Info Card

Sector mounts
PiRod, Inc.

▼ **Universal T-frame sector mounts:** provide precise directional control of antennas without the need for additional downtilt brackets; versatile mounts attach easy to any communication tower with standard four-and-a-half inch O.D. pipemounts; two adjustable tiebacks assure a rigid and stable mounting system; antenna spacing is easily adjusted on the 15-foot wide T-frame mounts, while additional mounting points can be added at any time; installation and service access are made easier by the T-frame design, which incorporates a standing rung for service personnel.



219-936-4221; fax 219-936-6796; www.pirod.com
Circle (210) on Free Info Card

Remote vehicle
Cruise America

• **Fun Mover:** available in three different lengths — 28', 31' and 38' — the FunMover offers a fully self-contained motorhome section with room for four to six people, depending on the model selected; features air-conditioning, heat, a generator, bathroom and shower; separate studio section offers four different studio sizes: 8'6", 9'5", 12'6" and 16'6"; all interiors are 8' wide.

602-668-4421; fax 602-464-7302
Circle (205) on Free Info Card

New Products

Digital mixer
Panasonic/Ramsa

▶ **DA7:** 32-bit, eight-bus, six-aux mixer offers 24-bit I/O capability, surround-sound mixing mode, dynamic and snapshot automation capabilities, and an ergonomic console with an analog feel; "LED Farm" provides quick look at the routing status, automation modes, channel on/off status, EQ on/off, dynamics on/off, panning on/off and aux send on/off; quick access to the console's current configuration is accessible via a screen graphic display designed to eliminate having to dig deep into layers of screens to view routing configurations; parametric EQ and dynamic controllers such as compressor/limiters are assignable on all inputs and aux returns; dynamics section can be set to compressor/limiter/gate or expander mode, and provides control of attack, release times, slope and threshold.

714-373-7277; fax 714-373-7903
Circle (212) on Free Info Card

Flexible rack system
Knürr USA, Inc.

▼ **Miracel:** includes 19-inch basic frames and basic, LAN, metric module 18 and 20 module, server and computer racks between 23RU (40.25") and 46RU (80.5"); available in three widths and three depths with optional NEMA 12, UL 1244 and Belcore Zone 4 (Earthquake) ratings; doors open 180° in stand-alone or bayed-together versions and can be removed and/or reoriented from left- to right-hand hinged; 19" metric components can be installed in dedicated or hybrid enclosures to provide you with a future-proof system.

805-526-7733; fax 805-584-8371
Circle (213) on Free Info Card

Acoustical Wallcovering
Netwell Noise Control

• **Silence:** attractive, durable, lightweight acoustic wallcovering is made of a class A fire-rated, ribbed, woven polyester fabric; available in 24 different colors; material has an acrylic backing, is velcro compatible, mildew, mold and fray proof.

800-638-9355; fax 612-939-9836
Circle (214) on Free Info Card

NAB announces Radio Board nominees

The National Association of Broadcasters announced nominees for seats on its 1998 Radio Board. Listed here are NAB members who have been nominated to the Board in the even numbered districts where seats are open.

- **District 2**
  David S Gingold, President/COO, Barnstable Broadcasting, Newton, MA
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  George Nicholaw, VP/GM, KNX, CBS, Inc., Los Angeles, CA

Youth membership proposal introduced

SBE Membership Chairman Robert Hess introduced a proposal to the SBE Board of Directors outlining a program that would allow high school-aged youth first-time involvement with the Society. The goal of the program is to educate young people about broadcast engineering and to foster an interest in careers in the field.

By offering students Youth Membership in the SBE, the Society can provide information and resources to help develop interest, enthusiasm and knowledge in the science and art of the industry, thereby increasing the number of students who go on to post-secondary education with intentions of entering broadcasting's technical fields.

In addition to other opportunities, the Society would provide each Youth Member with a special two- to four-page newsletter published three times during the school year. The newsletter would contain basic technical information supplied by interested volunteers, stories about student-operated stations and information about SBE-approved post-secondary schools. Local chapters would also be encouraged to offer occasional opportunities for Youth Members in their area to attend special programs or chapter meetings, with the hope of that contact leading to internships and mentor relationships.

The Membership Committee will review the proposal and make a recommendation to the Board for action during its April meeting. If approved, the program could begin as early as September of 1998.

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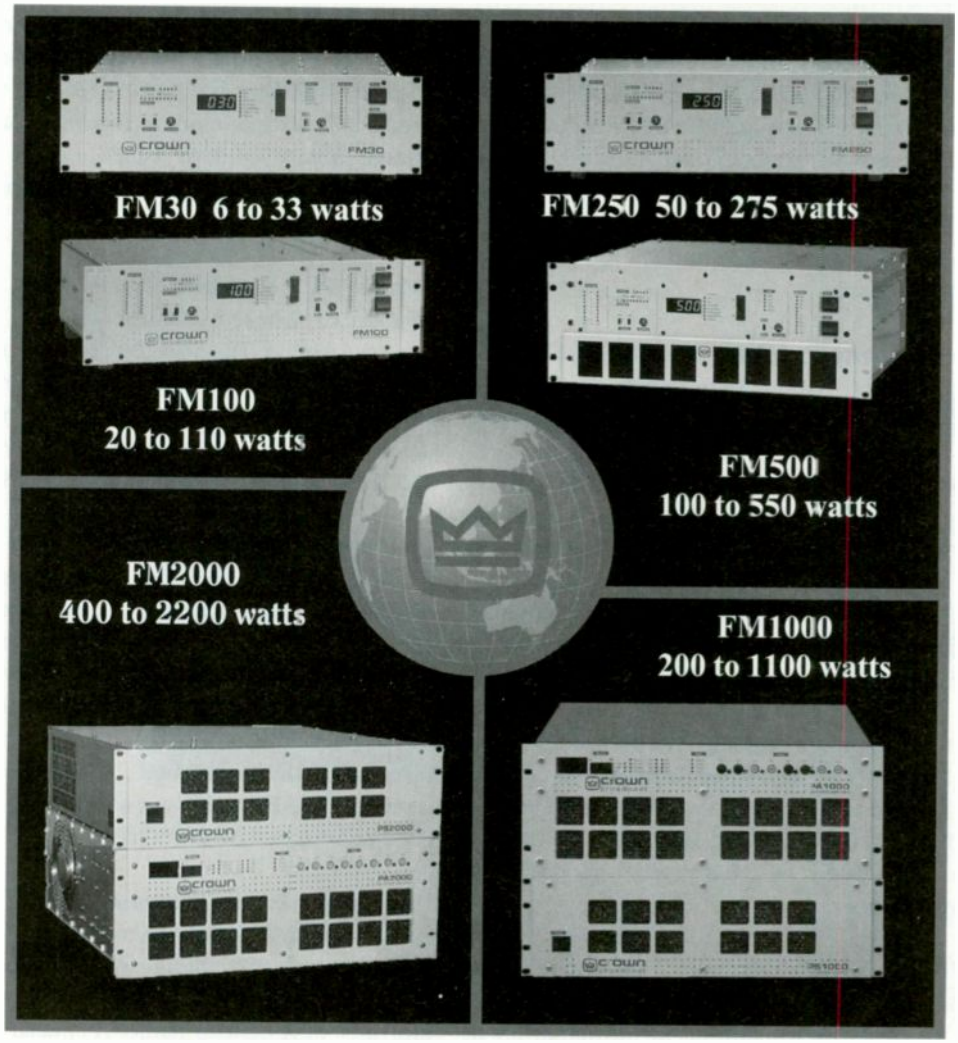

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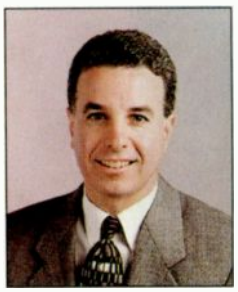
Business/People

BUSINESS

Telex Communications, Inc., Minneapolis, MN, and **EV International, Inc.**, Buchanan, MI, announced intentions to combine companies. Telex and EVI are both controlled by affiliates of Greenwich Street Capital Partners, Inc. The companies will benefit from combining their extensive and established worldwide distribution networks, multinational manufacturing expertise and the research and development resources.

Raytheon Company completed the sale of its Chicago-based **Switchcraft, Inc.** subsidiary to a company organized by the Cortec Group, Inc. and Switchcraft management. The deal is reported to be worth approximately $69 million. The business is to operate under the Switchcraft name and Keith Bandolik will continue to serve as its president. No changes in employment levels are expected.



As part of the company's ongoing nationwide rollout of technology and services, **Musicam Express** has opened an office in New York City. The new office, located at 100 Park Ave., 16th Floor, New York, NY 10017, (212) 880-2606, is being headed by Musicam's regional sales manager, Fred Rogers.

ElectricVillage, Santa Cruz, CA, announced that Triathlon Broadcasting Company, San Diego, CA, has committed all of its radio stations to participation in Radio-VillageNet, a joint initiative by ElectricVillage and the Katz Radio Group, New York, designed to bring Internet revenue to individual radio stations. The effort offers groups, networks and individual stations turnkey solutions for developing and maintaining websites in order to attract national Web advertising and revenue.

GlobeCast North America, Culver City, CA, has signed an agreement with Walt Disney World to provide full-time T-1 service between the Disney-MGM Studios in Lake Buena Vista, FL, and the ABC/GlobeCast radio facilities in Los Angeles and New York. ABC/GlobeCast's T-1 service is a digital audio circuit that will deliver signals from on-air personalities broadcasting live from Walt Disney World to the ABC/GlobeCast radio facilities. The signals will then be uplinked and transmitted via satellite to the radio personality's local station.

Spatializer Audio Laboratories, Inc., Woodland Hills, CA, announced a plan under which MultiDisc Technologies, currently a wholly owned subsidiary, will be reorganized into a separately financed corporation, MultiDisc. To date, MultiDisc has developed the technology for a family of next-generation modular, stackable, optical storage library systems based on its proprietary and patent-pending robotics, electro-mechanical and software designs.

Clark Wire & Cable, Mundelein, IL., announced the addition of Winsted modular consoles and racks to its product offering. The Winsted consoles and rack slide kits use a modular component system design that allowing to configure console and rack solutions to meet exact requirements. A full line of integrated system-oriented consoles and racks is now available through Clark Wire & Cable.

Jensen Transformers, Van Nuys, CA, signed an agreement by which **THAT Corporation**, Marlborough, MA, is granted exclusive rights to sell and sublicense the InGenius high-CMRR balanced line receiver. The InGenius circuit topology makes use of a circuit developed by Bill Whitlock of Jensen Transformers.

American Tower Systems, Boston, a wholly owned subsidiary of America Radio Systems Corporation, has agreed to sell $80 million in a private placement of its common stock to certain officers, directors and other affilliates of American Radio. A special committee of the board of directors of American Radio has approved the terms of the private placement and, subject to the execution of a difinitive stock puchase agreement and termination or earlier expiration of the waiting period, the private placement is expected to close in late January.

PEOPLE

Quantegy, Inc., Peachtree City, GA, announced that its president and CEO **Jack Kenny**, has resigned his position effective in early April. Kenny will continue to direct operations and will work with the company during the selection of a successor.

Charlie Cobb of the Federal Communications Commission was presented the Marconi-Bell award by the National Association of Radio and Telecommunications Engineers (NARTE). Cobb was presented the award in recognition of his distinctive accomplishments and innumerable contributions to the industry during his more than three decade tenure with the FCC Laboratory.

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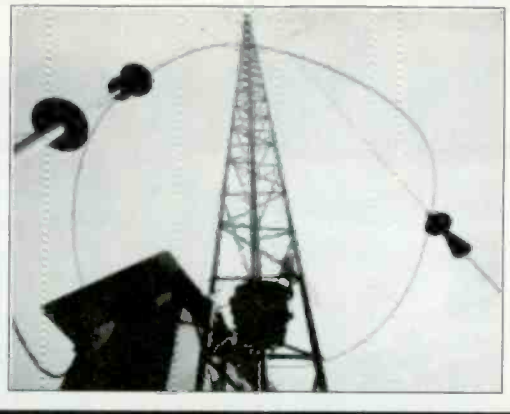

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when they first hit the Web, then jump elsewhere from there (if necessary). This brings a lot of eyeballs through the portal site, which can be sold to advertisers at a premium. Portal sites therefore value good content, and want lots of it. This makes them willing to offer high-speed, on-line server space (and its requisite maintenance) to content-providers at inexpensive rates, in return for the addition of their content to the aggregator's portal site.

Obstacles

A major difficulty in providing access to most webcast streams today is that each listener is logged on to the server independently, even though all listeners are receiving the same file at the same time. This is called *unicasting*, and it forces the originating server(s) and Internet connection(s) to burn up precious bandwidth in providing identical data to multiple users separately. This severely limits the number of listeners that can log onto most webcasts and greatly increases the cost per listener. Depending on the server configuration, these limits typically run from a few dozen to a few hundred simultaneous users. Large, distributed multi-server systems (such as portal sites) may reach a few thousand users simultaneously via unicast architecture.

But an alternative called *IP multicasting* is now emerging. This allows the originating server to feed a single webcast stream to the Internet, with listeners' local ISPs providing "copies" of the stream as needed via *replicating servers*. This new protocol must be supported by the streaming software used (some recent players can already handle it) and all the Internet routers in the path. A number of ISPs and portal sites have now enabled multicasting, with more in the process of converting. Widespread deployment may come about within the next year or so.

Another "per-listener" cost of webcasting comes from the encoder licensing fees levied by some streaming audio software companies. For broadcasters interested in large webcast audiences, these fees can be substantial, and they stand as an obstacle to growth of an on-line audience. Not all streaming audio encoders share the same fee structures, however, and some charge no fee at all. Broadcasters should weigh the value of encoding in each format against its cost, just as they assess the value of the ISPs or portals they consider for service relationships.

The road ahead

Change continues to inundate the on-line world. Keeping up with this new medium will be a challenge, but broadcasters possess one of the most valuable and renewable assets that on-line service providers and users seek: content. The synergy of the on-air and on-line services seems undeniable, and today's radio pioneers are blazing trails to find the proper balance between these two very different distribution mediums. While one exists in a milieu of scarcity, regulation and maturity, the other is young, wide-open and fraught with uncertainty. Broadcasters, particularly those with a large consolidated asset base, have the foundation from which to speculate today on what may become a large part of their future business.

From a defensive perspective, the long-term future of *on-air* radio service is also somewhat speculative, given the uncertainty of terrestrial DAB and the coming of mobile DBS radio. This should also stimulate forward-thinking broadcasters to explore new possibilities.

The barriers that seem to hold on-line radio in second-class status today are also subject to change. Access to higher bandwidth is inevitable, and improved compression and distribution technologies continue to flourish. Affordable mobile Internet access, via terrestrial or satellite links, is on the horizon, as well. Most importantly, consumers continue their seemingly inexorable movement toward an on-line lifestyle. Broadcasters will want to be a player in the new world of e-commerce, leveraging a potentially unique combination of on-air and on-line services. Clearly, the Internet is radio's next frontier.

COMING IN THE MARCH ISSUE OF BE RADIO . . .

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The industry's most complete overview of what to expect at NAB '98 including the BE Radio Fast Track, a preview of sessions, hints for making your NAB experience the best it can be and the BE Radio Extra! – a sneak peek at some of the new products.

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The technology we work with changes quickly and the test gear we already own may no longer be suitable.

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Even lasers get the blues

By Skip Pizzi, editor-in-chief

When the CD emerged in the early 1980s, it brought an astounding (at the time) 680MB of storage to a 4.7 inch disk. The format's players used infrared lasers, the most viable type of laser diodes available for mass production at the time. Their light output had a wavelength of around 860nm, in the so-called near-infrared spectrum.

Recently, the 4.7-inch optical disk was updated to the DVD (Digital Versatile Disk) format, which increased capacity to over 4GB. This improvement was provided in part by the use of a laser diode operating in the visible red spectrum, with wavelengths of 630- to 650nm. The DVD format also includes some incremental improvements in tracking accuracy, plus it adds the option of multi-surface focusing (i.e., double-layer and double-sided disks), for a maximum capacity of 17GB. But the change in the laser's wavelength alone is responsible for about a 2:1 increase in storage over the CD format.

Current research is now developing the next wavelength-based capacity multiplier, in the form of a mass-produced, cost-effective blue laser diode. Its wavelength is in the 415- to 450nm region, and it is expected to allow per-surface capacities of 15GB or more on a CD-sized disk.

The reason that these wavelength reductions seem to have a disproportionately high impact on optical storage densities becomes clear when you visualize the way a laser interacts with the disk. The laser illuminates a circular spot on the disk, the diameter of which is essentially determined by the wavelength of its light. A smaller spot allows higher density in two dimensions — pit length and track pitch — so the increase approximates the square of the proportional change in wavelength.

The breakthrough

Laser light has been produced across a wide range of light frequencies for several decades, but making cheap and efficient lasers is the real key to their usefulness in optical storage and other commercial applications. Such development had produced blue light in laser diodes and LEDs made from silicon carbide (SiC) devices, but their output was dim and unstable.

In the mid 1990s, Japanese scientists at a company called Nichia Chemical Industries announced a breakthrough in this regard using Gallium Nitride (GaN)-based devices. This eventually allowed bright, stable blue LEDs and laser diodes to be produced in a fashion similar to that used for today's infrared and red devices.

GaN had been tried for light emission as early as 1968 at RCA, but it was rejected for its low efficiency. The Nichia breakthrough is attributed to a heat treatment process that greatly improved the power output of the material. Mass production of GaN-based blue LEDs is already underway by several Japanese and US manufacturers, with blue laser diodes expected to follow suit soon.

Applications

As with any emerging technology, a healthy demand drives down costs quickly. The possibilities in this regard for GaN-based laser and LED products bode well. The technology is actually capable of producing a wide range of light frequencies, and therefore has a significant potential for application in many areas besides optical storage.

These include other products already employing lasers such as scanners, fax machines and computer printers, as well as improved LED devices like large video screens and other visual displays. They can even be used for room lighting and traffic signals, where their energy savings and long lifetimes may provide substantial cost benefits over traditional incandescent and fluorescent systems.

The military also has interest in the technology, and is sponsoring additional research and development efforts on GaN-based devices. Projected uses for this market include biochemical warfare reagent detection, covert communications and solar-blind missile threat warning.

In electronic media, the first application will likely be for HDTV optical disk players, the heir-apparent to the CD/DVD dynasty ("HDVD"?). Like DVD, the blue lasers in these devices will be able to read the earlier formats' disks, so backward compatibility is assured. Multi-sided, multi-layered disks of this type could approach 100GB capacities, although no manufacturer has announced any such formats to date. In consumer media, business matters may have a pivotal effect in how far this capacity push is driven. For example, just how much data is required in each new product's release? Coincident improvements in data compression and multimedia formats will also play a role here.

The development of the commercial blue laser diode is another reminder of how technology marches to a steady and continuous beat. Just as the DVD begins to hit the market, the seminal technology for its replacement is announced. Meanwhile, there's probably someone working hard in a lab somewhere today on a method of mass-producing ultraviolet lasers.

Industrial Strength Digital Audio Delivery

Digital Audio Delivery systems are now recognized as a must for every broadcast facility. But few systems provide the features, flexibility or reliability required to maintain profitability in this demanding and fault critical application, nor the support mechanism to maintain them.

The ENCO DADPRO32 Digital Audio Delivery System is simply the most powerful On-Air & Production system available. Based on the already widely accepted and mature DADPRO product, but now optimized for the Windows NT® operating system, DADPRO32 is unique in its uncomplicated user interfaces and adaptability to any format, yet harnesses the power and reliability of proven technology.

- Intuitive On-Screen User Interfaces that are immediately familiar to operators. Optional Touchscreen makes Live Assist operation quick and easy.
- Complete On-Air flexibility for Live Assist, Automated, or Satellite Programmed operations, with transparent transitions between modes. Seamless Segues and Voice Tracking provide a continuously "Live" image.
- Powerful Production and Call Processing capabilities, including Graphic Cut & Paste Assembly Editing. Automatic Recording features are included for catching network feeds.
- Interfaces to all Music and Traffic Scheduling and Billing systems.
- Features full 32-Bit Processing and True Multitasking capabilities. Many third party programs, such as Multitrack Editors, Wire Capture systems and Word Processors may be directly embedded into DAD, or operated on the same Workstation.
- Inherent support of Global Wide Area Networking, for sharing of data between multiple facilities. Ancillary products are available for Store Forward operations and remote management of unmanned downlink sites.
- Operates on commonly available "off-the-shelf" computer hardware and network architecture, utilizing any of a wide variety of redundancy configurations.
- DAD is an outright purchase, and there are no monthly licensing fees. Free software upgrades are provided for the first year. ENCO technical support is legendary as the best in the business.

Digigram POWERED

Call Your DAD Dealer or ENCO For Complete Information or Demo

Check Out The ENCO Web Page At: www.enco.com

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