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February 2000
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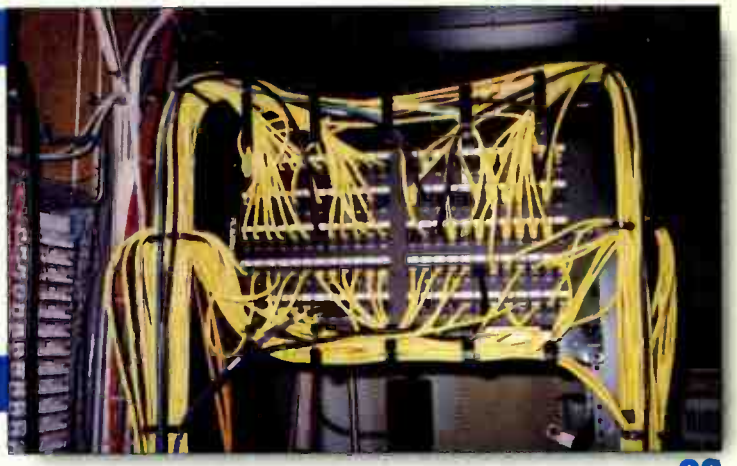

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In the public interest

A dream for some and a nightmare for others is now a reality. The FCC has adopted LPFM. Almost one year to date after the initial NPRM, the ruling and subsequent Report and Order has been issued, creating a new type of FM broadcast service. (For the complete rundown, see FCC Update, p. 24.) While awaiting the creation of this new service, pirate radio supporters have waved the idea as their Jolly Rodger. Though the resulting ruling has not left the pirate banners flying high, licensed broadcasters are still taking aim at their colors.

Most broadcasters and the NAB opposed LPFM from the start. Based on what I have heard and read on online broadcast forums, this stance has not changed. The areas that are still a point of concern include the removal of third-adjacent protection limits and the lack of public file requirements and ownership reporting. Interestingly, the opposing camp, the LPFM supporters, also takes issue with these points.

Existing broadcasters believe the service is unnecessary and it has gone too far. LPFM supporters feel the service will not be able to survive or meet its intended goal because of the limitations that have been set. Even the website created by Rodger Skinner, one of the original LPFM proponents, laments the death of LPFM. He claims that the ruling is so watered down from his original petition for rulemaking (RM-9242) that it will not be a viable service for those it was intended for.

The statement made by Commissioner Furchtgott-Roth, the only commissioner to fully dissent on the rulemaking, identifies many of the problems with the service as it has been created. As the ruling stands, there will only be one LP100 in a top-10 market: Houston. An LP100 will not be possible in other major markets like Miami or Washington. Commissioner Furchtgott-Roth also points out that, before LPFM, the Rules allowed for 101W stations to be licensed, and that a waiver might be granted for lower power levels if it were sought. To his knowledge, there have never been any applications for a license like this. Thus, he questions the supposed demand for these services. Commissioner Furchtgott-Roth went on to mention other specific issues that need to be addressed, including EEO and educational content.

In 1978, the FCC deemed that FM stations with power levels of less than 100W were an inefficient use of spectrum. Apparently, this is no longer the case.

The tests conducted by both sides revealed results favoring the side that commissioned the tests in the first place. This is how the law works — my counsel can outmanipulate your counsel. The entire LPFM issue was a project of Chairman Kennard, and it appears that he got his wish without having to listen to anyone. With the NAB opposition and Oxley's congressional bill, however, Kennard still has work to do.

We already know that the FCC cannot police the existing broadcast bands. Not only are pirates breaking the rules, but licensed stations are as well. Adding more stations in some remote areas will not help them do the job that a station's regulatory fees are supposed to cover.

The concept of LPFM was driven by concerns about station programming choices, largely due to massive consolidation. Instead of addressing an ownership-driven programming with the same tools, a bandage was created to address the problem with a technical solution.

There will be a stir when LPFM stations are first licensed and begin operations. The excitement and interest of the new owners is likely to fade, as will many of the new stations.

Chriss Scherer

Chriss Scherer, editor

You can read the complete Report and Order, the commissioners' statements and other points of view at Currents Online, on the BE Radio *website. Go to the Currents Archives and look for LPFM stories.*

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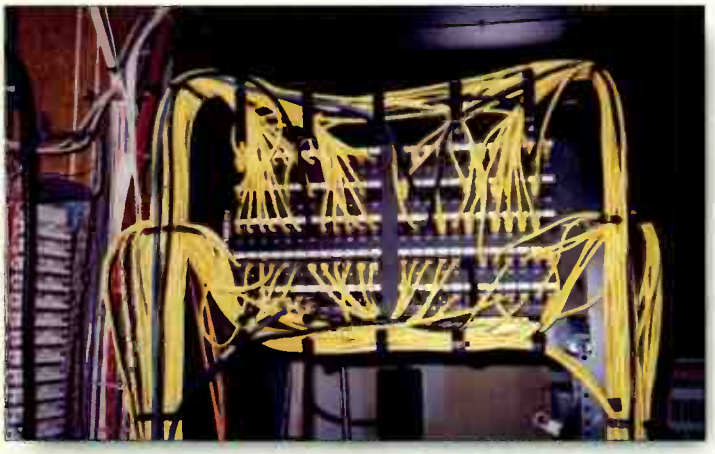
Spring checkup, (part 1, the studio)

By Kirk Harnack

Now that we are all Y2K compliant and those big summertime projects are not yet consuming all of our time, this is the perfect time to turn our attention toward a technical checkup inside the studio and office. A thorough studio/office checkup will require carrying out routine maintenance in several areas: computer systems, the LAN/WAN, automation and DAW, and heavy-use equipment.

Office computers

Windows 98 PCs should be updated using Windows Update. This utility logs the workstation onto a Microsoft website and automatically checks for the presence of important patches and software updates. Performed regularly, download installation is relatively quick. However, if this task has not been performed lately on each machine, plan to start the process and move on to something else while the updates are downloading. It seems the majority of these updates are security patches. Therefore, PCs that connect to the Internet, either via Internet-connected LAN or via modem, should be updated regularly.



LAN performance can be easily compromised by cabling and other hardware.

Check with your major software vendors, too, for product updates. Contact-management software, traffic and billing, and music-scheduling software are all worth checking on for the latest versions. Many software companies offer updates and patches via the Internet — some even check and update automatically.

Lately, I have found several PCs running a myriad of software at startup. On a Windows 95 or 98 PC, type *Ctrl + Alt + Del* to see a list of the tasks that are running. More that five or six items on this list may be indicative of software running at boot-up that you are not aware of.

On Windows 98 PCs, run *msconfig*. The *Startup* tab allows selection of what will and will not start upon booting. In some instances, several virus checkers may be running, which will result in a slowdown. Pare the list of startup services to only the items needed.

Is the traffic computer running a bit slow? Have the sales department workstations been ignored since they were installed? Perhaps it is time for a hardware upgrade. Most PCs will operate happily with the original operating system (OS) and software they came with. However, adding RAM-hungry applications and upgrading the OS will likely result in less-than-optimal PC performance.

The usual hardware bottlenecks to PC performance are RAM, video adapter and hard-drive space. Fortunately, the price on all of these items is lower than ever before, and installation is straightforward for PCs made in the last two or three years. Older PCs, especially '486 and earlier models, usually are not worth the trouble of upgrading for Windows applications. They are best relegated to single-use applications or non-Windows operating systems.

LAN/WAN review

They do not require regular maintenance, but local and wide area networks (LANs and WANs) should be checked from time to time.

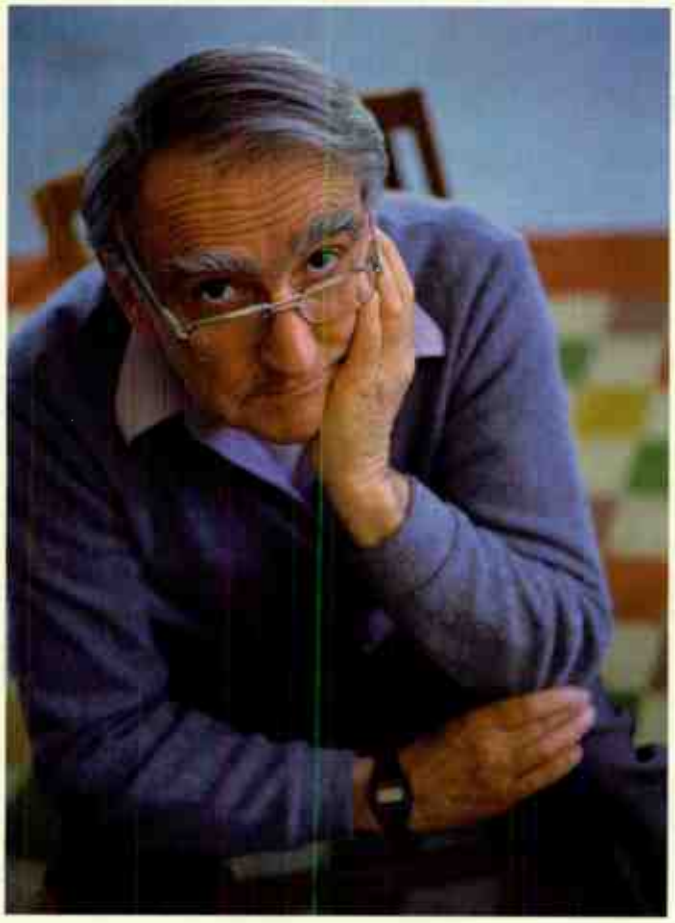
A faulty NIC or hub may clog your LAN with gibberish. Examining the data activity lights on the network hub(s) when no LAN-dependent applications are running can make for a perfunctory check. More than an occasional data burst may indicate a bandwidth hog in the system. Shareware and commercial software packages are available to diagnose various LAN performance problems.

Poorly performing cabling can tie up a LAN. Packets are re-sent until all the checksums are good tying up bandwidth on most shared LAN systems. Cable analyzers are available in several cost/performance ranges to test and troubleshoot the cabling installation.

Are you getting all the WAN bandwidth you are paying for? Many broadcasters using WAN services will want to measure their WAN performance at least annually. Where possible, measure and record bit-error rates, loss packets and other such parameters. Be sure you have easy access to circuit numbers and trouble or test phone numbers with your WAN circuit provider.

Automation and DAW maintenance

Software upgrades. Most engineers were reacquainted with their automation tech support department(s) recently



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for Y2K software updates. As might be expected, some of those Y2K updates introduced other, unanticipated problems, requiring further troubleshooting and updating. Consequently, tech support personnel have been working overtime to resolve customers' issues.

When calling tech support, be sure you've done your homework. Be prepared to give a summary description of the problem, then give more detail if warranted. Presenting a pleasant demeanor is actually helpful, too, even if the situation seems dire and the problems are urgent.

Hardware maintenance. Regular maintenance of automation systems and digital audio workstations (DAWs) is similar to regular PC maintenance, with two important exceptions: First, ask the vendor for advice prior to any work. Second, schedule the maintenance with the support and approval of the programming (on-air) department.

Most PC-based audio storage and playback systems contain at least some proprietary hardware. Their internal configuration may differ from off-the-shelf PCs, too, necessitating additional care in preventive maintenance. Discuss preventive maintenance procedures with the tech support people for each system in your care. They will have provide important dos and don'ts to observe while cleaning and inspecting the hardware.

If you are not on a first-name basis with a vendor's tech support department, you will improve the relationship quickly by letting them know honestly what your skill level is. Support technicians are often hesitant to recommend complex or dicey maintenance procedures to those without good computer hardware knowledge.

If you feel your own skills need improving, do your experimenting on a noncritical computer. When mission-critical computers need troubleshooting, use those precious minutes or hours to observe, take notes and learn whatever you can about the hardware while the machine is off-air.

Keeping the jocks happy

Many engineers abhor repairing abused equipment. Nevertheless, perhaps the best way to improve relations with announcers, producers and other talent is to fix all of those little convenience items they use every day.

How about that mic cable with a short (we engineers know it's really an *intermittent open*)? That headphone jack that keeps cutting out? The *off* lamps on half of the console modules? That scratchy pot for the monitor volume? These and other similar items are often quite easy to repair. Sometimes they are so easy we take them for granted and then never get around to them.

Here's a contracting business tip. Often, when I go into a client station to do some "serious" engineering, I'll first see the program director or one of the announcers and get a list of little things to be fixed in the control and production rooms. Usually, within 45 minutes to an hour, I'll have these nuisance repairs done. Next time I come back, the whole air staff is happy to see me, and their positive comments make it up to the invoice-approvers.

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

The year for IBOC?

By Chriss Scherer, editor

The topic of IBOC DAB has had an incredibly long life. It seems that just as the fodder for discussion dies down, another development occurs, and all the buzz begins again.

As usual, at the Consumer Electronics Showcase, held in January, several new technologies were on display (see The Last Byte, p. 62). This was the first opportunity for DAB to bask in the consumer limelight, and reports say that both IBOC and S-DARS had good receptions. USADR and Kenwood, one of USADR's technology partners, displayed a prototype IBOC car stereo that worked on the USADR system.

This prototype IBOC car stereo from Kenwood and USA Digital Radio was shown at the recent CES convention.

Deals and deadlines

Up until December, there were three IBOC proponents working independently on their own systems. Near the end of December, an alliance was forged between two of the proponents, Digital Radio Express and USA Digital Radio. True to the IBOC path, this step prompted several conversations and stirred plenty of speculation.

The National Radio Systems Committee, a joint effort of the EIA and the NAB, established December 15,1999 as the deadline to submit test data for a system evaluation. All three proponents agreed to this date. Each was to provide information on its respective system so that the NRSC could begin its evaluations.

USADR and DRE made their announcement just before the NRSC deadline. USADR was the only proponent to submit results. DRE did not file because of the new agreement. Lucent Digital Radio sent a letter to the NRSC stating that it would file its data as soon as possible but that it was also working on comments for the FCC's NPRM on IBOC. LDR cited that, because it was working to supply information for the FCC and the NSRC, it made more sense to do the work once for both parties. LDR filed its data on January 24 to both the FCC and the NRSC.

In fairness to USADR for allowing LDR to file its NRSC data after the December deadline, the NRSC decided that USADR would be given two weeks after the LDR filing date to submit additional or modified data for consideration. Both USADR and LDR agreed to this compromise.

Not done yet

Now that both proponents have made filings, the data will be reviewed by the NRSC, which will first decide if either system is indeed an improvement over existing radio services. This process should be completed by the end of February. Once a determination is made that at least one of the systems exceeds the current performance, the NRSC will set forth its process of creating an IBOC standard.

With a public announcement, the standards creation process will commence. To create a standard, the committee will continue to evaluate data and information. Part of this process will include selection of an independent test laboratory to confirm that the proposed systems meet the specifications. The lab facility will be determined approximately 30 to 60 days after the standards process begins.

It will be up to the FCC to decide if the standard is acceptable and if a particular system will be chosen. The NRSC standards for AM were quickly accepted and adopted by the FCC. We will see if IBOC is handled in the same way.

To the future

An IBOC future has been a shaky speculation for some time. Questions regarding the long-term suitability of a system whose design began nearly 10 years ago are still being raised. Several companies and individuals have proposed that there should be a grand alliance of the proponents to further the IBOC effort. When mentioned at last fall's NAB Radio Show during the IBOC discussion panel, this idea was met with cheers.

The FCC's NPRM on DAB issued in November is seeing some action. IBOC now has a firm stance and is on the verge of making its first major steps. With no new spectrum available until 2007, IBOC has a clear path.

The time for a grand alliance is coming. If it is determined that only one of the proponents meets the standard, the alliance idea is unnecessary. If both systems are accepted, then an alliance will likely be imperative. The time to establish a grand alliance is about two months away, depending on how things go.

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Preparing for an emergency

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

Chief engineers must prepare their facilities for technical emergencies. An outline of areas to consider when planning for emergencies follows.

Primary power

In combination transmitter/studio sites, primary power failure closes everything down unless standby power is available. There is a tendency to underestimate total power requirements. For a true assessment of power needs, include all essential loads and allow for future power requirements.

A fallen tower is one of the most severe emergencies.

Photos courtesy of Broadcast Electronics.

Gasoline, diesel, natural gas and LPG are the standard generator fuel choices. Gasoline is typically used only for small, portable units because it is high-cost and has tough storage requirements. Diesel usually carries stringent storage rules, and exhaust noise and odor can pose problems.

Natural and LP gas are popular stored fuels, and in areas where piped-in gas is available, either can be an excellent choice. This power source rarely dries up in an emergency, although pipeline breaks can occur.

Separated studio/transmitter facilities require two standby generators unless a site is shared with an essential operation that has excess capacity available. The requirements for transmitter sites are similar to those for combination plants. It is often difficult, however, to locate standby generators for downtown studios because of fuel storage, exhaust noise and emission requirements. Use the same load considerations as for combination studio/transmitter sites. Factors such as air conditioning and heating should be taken into consideration.

Standby generator suppliers typically recommend running the facility on a weekly schedule of at least 30 minutes. Connect a large load when running the weekly tests to be sure sustained power can be supplied. Thirty minutes is the minimum time to run on generator after a power outage. In areas where outages or unstable weather conditions frequently occur, run on generator for about an hour to be sure the problem has cleared.

If remote operation is involved, weekly test runs should be monitored manually from time to time to ensure operation is as planned. Sometimes, not all operating parameters are remotely monitored and potential failures are overlooked.

Radiating system

Towers and antennas are often the links that fail in emergencies. Today, the tendency for AM stations is to construct auxiliary or emergency antennas only when needed. Some FM stations have small antennas mounted on short poles for emergency use.

The Rules do not specify the kind of AM antenna to use. The main injunction given in the Rules is to not extend coverage beyond the licensed contours and to use no more than 25 percent of licensed power. The Rules Part 73, sections 1675, 1680 and 3542 cover auxiliary and emergency antennas. The Rules require a letter requesting emergency authorization, though telephone authorization may be given during an emergency.

AM stations should select a skyhook, tree or convenient pole to support a wire. With an OIB, antenna dimensions and an approximate antenna resistance may be established. A prepared, reasonably efficient radiator can be constructed and stored for use in case of tower or other radiating system loss. Approximate operating current and power would be known, and service could be resumed quickly by hoisting up the wire and connecting it.

For FM emergencies, the best route is to find an FM bay of the correct channel and mount it on a pole or on the rooftop. Sometimes, part of an existing antenna assembly

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can be used. In most cases, power will be low, and a length of suitable, flexible coax can be dedicated to the project and ready for immediate use. Because FM transmitters require antenna/coax/transmitter matching, you should design a suitable connection point before an emergency occurs.

Control

If a transmitter site is manned, control and monitoring requirements take care of themselves. When using a remote-control, downed phone lines or fallen STL antennas pose problems. If power is available, the primary objective will be to get a stable and legal signal on the air as quickly as possible.

It is possible to use a cell-phone by permanently installing a maximum-power, dedicated unit at the transmitter site. Automatic changeover from the regular STL system can easily be designed and the transmitter controlled via the cell phone until the regular system is repaired. Cell and PCS services have certainly opened new possibilities. Unlicensed spread-spectrum equipment also provides a possible solution.

Program feed

Program material delivery depends greatly on the program source(s). Satellite receivers at the transmitter site that usually feed directly into the transmitter and require no local insertions for a specified time can often be allowed to run.

In cases where satellite material goes back to master control for production purposes, programming can be more difficult and methods will depend on local facilities and personnel available. In any case, provisions must always be made for local programming from the transmitter site by providing minimal studio and audio equipment and facilities.

Personnel safety

Most installations are adequately protected, but some items tend to be overlooked. At transmitter sites, provisions must be made for two engineers to work on equipment under repair. When AC power fails, automatic, battery-powered emergency lights are obligatory in studios as well as transmitter buildings.

Clearly marked and illuminated exits must be provided, and a station emergency-action bulletin covering engineering staff procedures should be in place. A clearly marked main disconnect switch must be provided to isolate equipment in buildings or areas where physical damage has occurred. If more than one transmitter is operating into an antenna on a common tower, power must be reduced as needed for the safety of personnel working on tower equipment. This is an FCC/OSHA/EPA requirement.

In common tower installations, do not overlook the possibility of dangerous RF pickup by a closely adjacent, damaged antenna when working in multiple transmitter installations. Ground any potential high-level RF voltages that may appear at the transmitter-end of a transmission line in such installations.

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

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Ron Castro, co-owner and GM, KRPQ Q-105 and KMHX MIX 104.1 Santa Rosa, California

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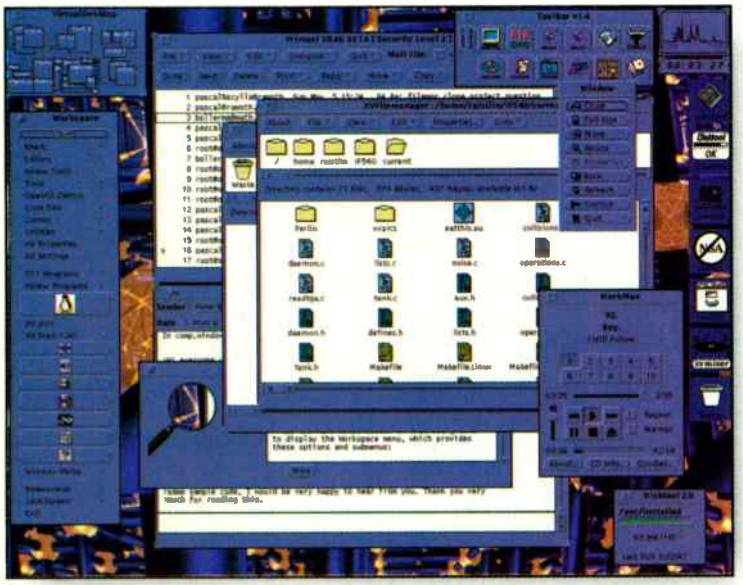
LINUX around the station (part 2 of 2)

By Kevin McNamara

Last month's column provided background on the LINUX operating system and some of its hardware requirements. This month, the series concludes with a look at the desktop, communication hardware requirements, server configuration and some cool applications.

Desktop

LINUX is a multi-user/multitasking operating system. Unless you are simply setting up a stand-alone LINUX server as an experiment, you will want to connect the server to other computers through a network or modem connection. A networked LINUX server can be made to work with dumb terminals, PCs with terminal programs or a client's program that permits LINUX to operate within Windows.



X-Windows provides a familiar Windows environment that is completely configurable. Shown above is just one configuration.

You may think a system that has its roots in UNIX would provide some type of text-based screen, especially those of you who have worked on early versions of high-end newsroom systems. The reality, however, is that LINUX (and every other UNIX derivative) supports a graphical environment called the X-Window system. As it turns out, the X-Window system was one of the first Windows-type desktop graphical environments. The system was developed in the mid-'80s at the Massachusetts Institute of Technology.

X-Windows is distributed in free or low-cost versions. Various implementations of X-Windows are available; however, XFree86 is commonly used with LINUX distributions. The X-Windows desktop is similar to a desktop used with a PC or Mac operating system and comprises five basic objects: 1. The screen defines the entire video display; 2. The root window is the background of your screen, similar to wallpaper; 3. The window manager provides the interface between the user and the X-Window system, allowing customization of the window; 4. The pointer provides a visible shape on the screen that corresponds with the position of your mouse or other input device; 5. The window is a frame that contains an open application. An active window is the frame that contains the application in which you are currently working.

Because of its modular and open design, the X-Window system is highly customizable. Extensive libraries of software can be downloaded from the Internet, at little or no cost, providing a wide range of custom desktop themes and capabilities. Another useful software package is Samba. Samba, which is free, includes programs that are loaded on the server and client workstations and allow a high level of file and printer integration between PC-based workstations and a UNIX-based server.

Communications hardware requirements

LINUX currently supports virtually every popular networking protocol, including TCP/IP (even Ipv6), IPX/SPX, ISDN, Frame Relay, T1 and PPP. LINUX also supports the majority of PC and PCMCIA network interface cards and modems. Current listings of supported hardware are available on the Web. Chances are good that some of the older hardware you have on the shelf can be incorporated into your LINUX server.

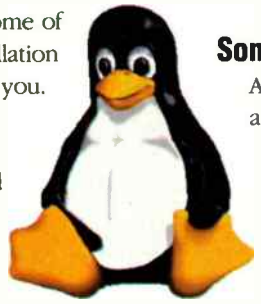
LINUX also works with all current networking topologies, including Token Ring and Ethernet. In fact, most Gigabit Ethernet hardware is supported. A basic search

on the Web will reveal drivers that allow your LINUX server to communicate with wireless networking hardware and even the infrared port.

The latest versions of LINUX will automatically detect plug-and-play hardware that is supported. If your server has more than one type of hardware installed (e.g., two network cards), you will have to add the configuration information for the second device manually. Some of the commercial distributions even have installation routines that handle many of these problems for you.

Configuring the server

You have two basic choices for setting up and configuring your server: either download the required software and manually set up the system based on your hardware or purchase one of the commercial distributions that includes installation routines to help you through the initial setup. Unless you have a decent background in UNIX, the latter may be preferable.



The LINUX logo.

The commercial distributions contain printed documentation and a reasonably large library of programs and drivers that will save you the time it takes to search for them over the Net. You will be able to enhance your system with any of the free downloadable libraries or perhaps write your own drivers after you have a chance to learn the system.

Extensive sources are available on the Internet, in the form of "how-tos," to help you with your server. These sources provide detailed information for setup and configuration of specific applications. Other information can be found on related newsgroups, chat rooms and LINUX-specific websites located throughout the world. Magazines such as the *LINUX Journal* are also an excellent source of news, information and applications.

Some applications

As you can see, the LINUX operating system is an extremely flexible and well-supported platform. Up to this point, we have looked at LINUX as a file server, though a PC running LINUX has the following additional uses.

Internet Server. LINUX is the platform of choice for the majority of Internet servers in the world today. LINUX servers are used for Web, FTP, news and e-mail. Most Web services running on LINUX use a program called Apache, which provides a complete and relatively easy way to implement a Web server. Like all projects under the GNU, Apache is available free of cost and has a growing library of available support programs.

Intranet Server. Why not configure a Web server to provide information locally to employees connected to your LAN or WAN? Many businesses use Intranets to not only offer timely company information, but also make available employee handbooks, time sheets,

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schedules and messaging.

Firewalls. These are used to limit access from outside computers to your local network. Increasingly, hackers are gaining access to company LANs. A successful penetration into your network could allow a hostile hacker to deliver viruses, download private information and intercept private e-mail. A LINUX server can be configured as a low-cost yet highly effective firewall for your Internet connections. A properly configured LINUX server can be inserted between your Internet proxy server and LAN file server(s), thus filtering TCP/IP addresses that are not trusted to pass information to your LAN from the outside world.

Multiple servers. Many stations now use multiple servers within a facility or market that are attached to a common backbone. In many cases, these servers are dedicated to specific tasks, such as traffic, digital audio storage and business. If these systems are tied to an Ethernet topology, all of the data intended for a specific server also appears across the entire network. The nature of Ethernet may cause the system to slow dramatically if a particularly data-intensive application is running, such as a large streaming audio file. To confine data traffic to specific servers, it is necessary to segment the network by adding a router. The router works like a firewall but limits the data that can pass through the LAN to specific servers, thus creating independent LAN *workgroups*. Configuring a LINUX server as a router is relatively simple by using two network interface cards.

IP masquerading. Many facilities are not equipped to access the Internet directly from a proxy server with a dedicated high-speed connection. If this type of access is not available, it is common to have separate modem connections (and costly telephone lines) to several PCs. You can configure a LINUX server to do something called IP masquerading. IP masquerading allows you to create simultaneous/multiple connections to the Internet, typically using a single POTS line, but it can also be applied to ISDN or fractional T1 lines. As you would expect, the more concurrent users and the slower the line, the more the overall connection speed will drop. IP masquerading provides a good solution under the following conditions: 1. No more than three users will need access to the Internet at the same time; 2. The speed of the connection is greater than 56Kb/s; and 3. Users will not hit many graphics-intense pages. LINUX also supports *spanning*, whereby multiple POTS lines can be used to increase the aggregate speed of the connection. To employ this method, however, your ISP must also support spanning.

I haven't discussed some of the more technical applications, such as control and data-collection systems, but I can assure you, LINUX is limited only by your imagination.

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

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LPFM service approved

By Harry Martin

The FCC has authorized the creation of a new LPFM service. The service will consist of 10W and 100W ERP stations that will operate on a noncommercial basis.

Power and coverage. LP10 stations will operate with a power of 1W to 10W and will have service areas of 1 mile to 2 miles. LP100 stations will operate with a power from 50W to 100W and will have service areas of approximately 3.5 miles. The commission did not adopt its initial plan to authorize LP1000 stations, which would have served much broader areas. Authorizing these stations would have precluded the establishment of substantially more lower-powered facilities.

Interference protection. The commission will impose interference protection requirements based on distance separations between stations rather than contour protection. Second-adjacent channel protections are incorporated in the interference criteria, but third-adjacent assignments will not be considered. The distance separation requirements are intended to protect the following: First, authorized commercial and noncommercial FM stations of all classes; second, existing FM translator and booster stations and any authorized LP100 stations; and third, pending applications for FM, FM translator and LP100 facilities that are on file before the issuance of a public notice announcing an LPFM application filing window. The commission has established a 20km "buffer" zone surrounding full-service FM stations to provide them flexibility in choosing new transmitter sites.

Noncommercial service. Unlike the commission's original proposal, the agency has determined that all new LPFM stations will operate noncommercially. Eligible licensees can be local governments, private educational organizations, associations or entities, or nonprofit entities with educational purposes. LPFM licenses will be awarded throughout the FM radio band and will not be limited to reserved NCE-FM channels. The commission's decision to limit eligibility to noncommercial entities avoids the problem of a commercial takeover of the LPFM service through auction processing.

Other eligibility requirements. No existing broadcaster or other media entity may have an ownership interest in, or enter any program or operating agreement with, any LPFM station. Additionally, LPFM stations will not be permitted to operate as translators. During the first two years of LPFM licensing, LPFM licenses will only be awarded to entities that certify they are physically headquartered, have a campus or have 75 percent of their board members residing within 10 miles of the proposed station. Also, during the first two years, no entity may own more than one LPFM station in any given community. Further, during the first two years, no entity will be permitted to operate more than one LPFM station nationwide.

Licensing procedures. Applications will be accepted during designated filing windows. The first such window, expected in May, will be for LP100 licenses. After processing of those applications, a window for LP10 licenses will be opened. Licenses will be granted for eight-year renewable terms but will not be transferable. LPFM stations will operate with four-letter call signs with an LP suffix.

Mutual exclusivity. When LPFM applications for a particular area are in conflict, the commission will resolve mutual exclusivity through a point system that will give equal credit for the following: an established community presence for at least two years prior to the application; a pledge to operate at least 12 hours daily; and a pledge to broadcast at least eight hours of local programming daily. Where mutually exclusive applicants have the same number of points, the commission will require time-sharing by dividing the eight-year license term equally among the deadlocked applicants. Such eight-year licenses will not be renewable.

Legal requirements. Pirate broadcasters will be eligible to participate in the new service only under the following conditions: They voluntarily ceased engaging in unlicenced operations by February 26, 1999 without specific direction from the FCC or they ceased engaging in unlicenced operations within 24 hours after being advised to do so by the FCC. LPFM stations will be required to broadcast a minimum of 36 hours per week and are subject to the FCC's sponsorship identification, political programming, station identification, EAS and obscenity/indecency rules. However, LPFMs will not maintain main studios or public files or file ownership reports.

More information on the LPFM application process will be available on the FCC's LPFM website at www.fcc.gov/mmb/prd/lpfm.

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

Dateline

December 1, 1999 ended the first cycle for filing biennial ownership reports. The next cycle will begin February 1, 2001. In the meantime, new ownership reports still must be filed within 30 days after consummation of a license transfer or assignment, upon grant of a construction permit for a new station and upon the filing of an initial license application for a new station.

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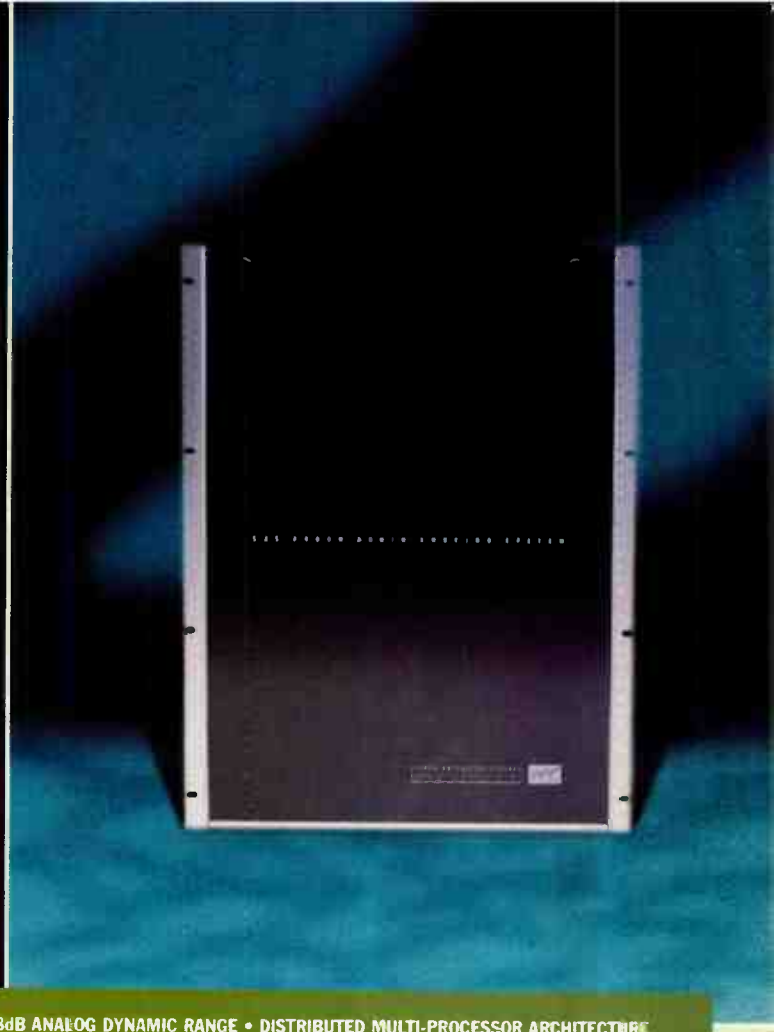

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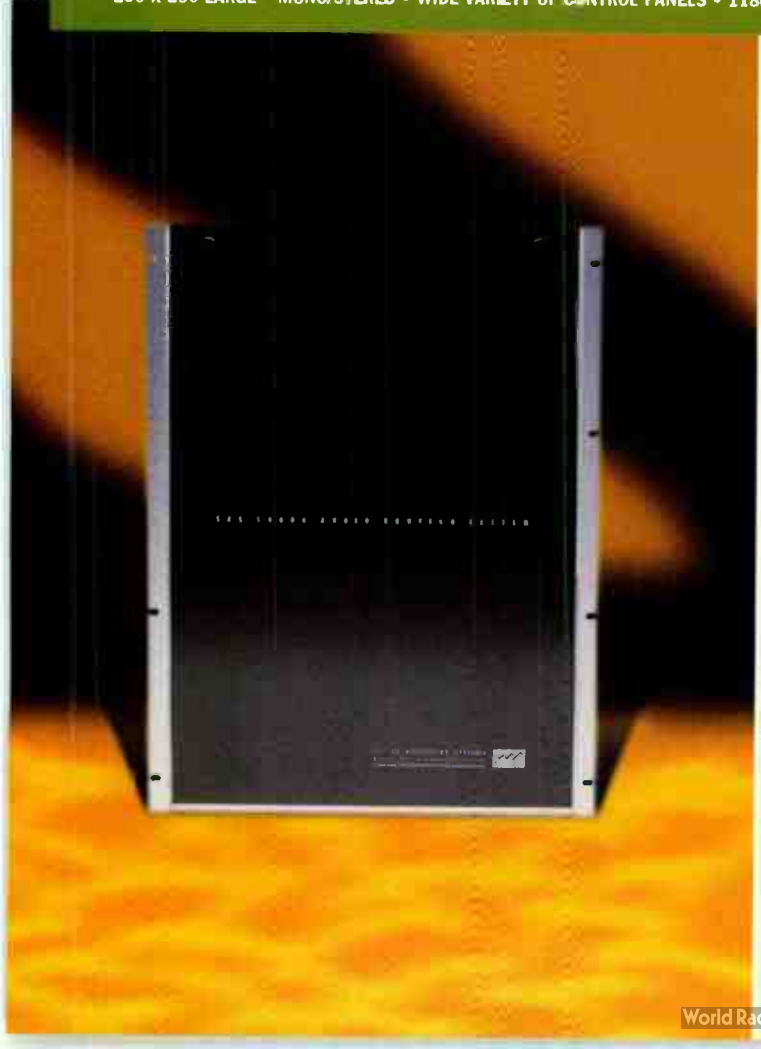

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REMOTE BROADCASTS

What you need to know to get your off-site programs on the air.

By Allan Soifer

Remote origination of radio programming is not a recent development. In the late 1920s, NBC radio crews were sent to cover all manner of news and human-interest stories with what was then considered portable equipment (sort of).

For a time, NBC news bureaus in New York, Chicago, Los Angeles and other centers assigned permanent editors to seek out and develop stories at remote sites. Their role was to provide the programmers with new and interesting live shows every day. The CBS Radio network was also known for its mobile news cars, which featured public-address trumpet loudspeakers on their roofs, blaring away the latest headlines. Reporters inside the vehicles communicated with their newsrooms via shortwave equipment.

In the '60s and early '70s, the concept of producing complete programming on the sponsor's premises was successfully explored. Remote origination equipment has progressed into the digital age, and many markets are rediscovering the promotional and sales potentials of remote programs.

To successfully take the show on the road, you must select the right equipment for the job. The tools needed in the field can be broken down into four major areas: playback devices, microphones, consoles and ancillary equipment, and transmission systems. Naturally, not all of these tools will apply to every situation.

Playback

Not all remotes require the ability to play source audio. In some applications, basic needs can be met with a mini-disc, DAT or cassette deck. If music is being played from the remote site, CD players may be required. Other equipment sources may be used as well.

CDs are a good format choice because many stations now own some type of CD burner. Special audio cuts can be recorded as needed. Some CD players, however, do not travel well. Hard drive-based systems can also be used, but excessive handling and vibration can affect these systems. Likewise, laptop computers are subject to the same handling concerns.

One option for portable equipment comes from the DJ industry. Dance DJs demand reliable equipment. Dance club audiences — like radio listeners — do not tolerate poor playback quality or interruptions in the music. Many manufacturers have catered to this market with lines of principal items and accessories. Equipment costs are comparable to broadcast gear, and technical specifications typically exceed standard requirements. Major manufacturers' warranties are also generous and cover the usual liabilities.

Consoles

The requirement of a mixer or console is directly dictated by the type of remote. For simple, voice-only remotes, a small, possibly battery-operated mixer can be used. Most of these units include a built-in limiter, which certainly helps keep audio levels in check. These small mixers can be carried in a transport-style attaché case, complete with storage for two mics and cables. You may even be able to fit the additional remote gear into the same case. Such portability leads to a simplified operation. As a result, the announcer scheduled to voice the reports from the client's premises can plug into a POTS phone jack, hit the preprogrammed dialup key and establish a two-way digital link within moments.

These smaller mixers are usually mono, but

stereo models also exist. The next step up is the mix-pad. These small mixers usually provide a limited number of inputs. They are, however, stereo and can provide additional mixing and routing for mix-minus.

Finally, a full console may be needed if the show requires numerous sources and mixing requirements. You may even elect to use a modular console, which allows for potential expansion and growth. In one installation of mine, a modular approach has worked well, providing 12 inputs for two CD players, three mics, two mini-discs, one cassette player and one digital playback unit. This adds up to only nine inputs, so there's still room to grow.

Photo by John Caracciolo.

The first step to a successful remote broadcast is deciding what equipment is needed. The required needs must be met, but build in redundancy and backups when possible.

Microphones

Most remotes feature at least one air talent, so at least one microphone will be needed. Wired mics are certainly reliable and immune to external interference, but wireless mics offer extended portability. (For a complete overview of microphones, see the feature story on page 38.)

Care should be taken to choose a channel far away from any used by local TV (ENG) news crews. Frequency agile receiver/transmitter sets can help make this task easier. A clear line-of-sight between transmitter and receiver is always preferred, but some newer designs provide quite good reception, even within steel buildings. A diversity system will also help improve antenna reception (see companion story, page 42). If circumstances warrant it, a wireless remote monitoring system is useful. Any wireless frequency should be coordinated with the local SBE frequency coordinator.

On remotes, most engineers prefer dynamic mics because of their ruggedness. Further, a cardioid (unidirectional) pattern minimizes extraneous noise pickup or possible feedback howl from PA speakers. By nature, condenser mics are more delicate and are usually best left in the studio, but there are exceptions, depending on the situation. Single-unit, unique-application condenser stereo mics that use the M-S (middle-side) stereo method are ideal for remotes that feature a group of interviewees around a table or a choir performing in a mall.

Remote transmission

For the main remote kit, listening off-air via an FM tuner is the easiest route. Consider this method if there is little or no delay in the audio path. Analog paths such as dedicated telephone loops and VHF RPU transmitters work well with this setup. ISDN and POTS codecs typically do not work well with off-air monitoring. Fortunately, these digital paths include a return audio feed to carry IFB and cueing information.

Current codec models offer either a straight conversion system or conversion coupled with multi-input mixing and monitoring functions. Your needs will determine which to use. The all-in-one packages make setup and operation easy. For more complex arrangements, external mixing may be required. Some of the all-in-one packages also use a codec with limited capabilities.

All of the above presupposes that your remote is to be done inside a store, a mall, or similar commercial premises. But what about live, on-the-fly operations? To answer this question, let's begin with the news-reporting vehicle. The minimum required is a two-way radio (UHF is recommended). With a little engineering ingenuity, an audio input can be modified to accept either the regular push to talk (PTT) mic or a line-level input from an external source. This will enable the field reporter to gather audio clips and send them back to the station for insertion into a newscast. For more sophisticated in-vehicle remotes, we turn to the van or SUV equipped with a multiple-input mic mixer, two-way radio, cell phone, audio recorder and an RPU transmitter.

An important word here about safety. RPUs

and other radio link systems are usually mounted on extendable pneumatic masts. The thought of that 30-foot mast contacting high-voltage wires overhead is a frightening one. Cold weather brings additional safety concerns regarding valve and pressure relief vent freeze-up. Death and maiming has happened to technicians who, despite warning stickers and safety routines, placed their news vans and antenna masts in harm's way. The answer lies in sufficient training, hard-and-fast safety rules, and nondefeatable safety interlocks and warning systems. Be sure to include any necessary safety options on the vehicles as required.

Compact mixers are perfect for remote broadcasts and range in many sizes from from belt-pack to tabletop. Shown here are examples from Spirit, Mackie and ATI (left to right).

The subject of RPUs can lead to a lengthy discussion. Microwave transmission and reception are complex technical issues. You may need a competent consultant to assess both your intended coverage area and also what you can realistically expect from a microwave system between the vehicle and the station. Installations are fairly expensive and involved, a special tower location may be needed to

Remote vehicles take the show on the road

Just as remote broadcasts are a staple of radio, remote vehicles are a staple of the station's presence.

By Chriss Scherer, editor

All stations cultivate localism and strive to be an integral part of their communities. Integrating your remote equipment into a vehicle allows you to go to a location, set up and be on the air in a short time. The use of remote vehicles simplifies the process of tearing down and relocating to the next event.

When planning your remote vehicle, you must first determine its main purpose. Because remotes are promotional by nature, the vehicle may serve a dual function for engineering/operations and promotions. If this

Continued on page 32

Photo courtesy of Will-Burt.

A remote vehicle can also serve as a rolling billboard.

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mount the station's receiver for optimum coverage, and licensing the microwave link may be required. One manufacturer has developed a laser/infrared two-way system, which needs no licenses and can multiplex several signals in both directions. Bear in mind that RPUs are usually effective for hops of less than 10 miles.

In a crowded city corridor with many office towers, it may not be feasible to use an RPU without placing several receivers in strategic locations. If you fall into this category, consider receiver backhaul sites at your city hall, a major arena or ballpark, and one or two sizable buildings on opposite sides of the town. Your station may be one of the few that has a generous budget for remote broadcasts. In this case, the ideal method is to lease time on a satellite transponder and to use mobile uplink facility trucks with a receiving dish atop the station. These trucks can be leased in larger urban centers. Onboard features of the larger trucks may include GPS-coordinated antenna orientation, a frequency agile transmitter, a mini-announce booth, full production and recording facilities, and even a chemical toilet and drinking water storage tank.

These racks are mainstays of the audio and staging rental industries. (A quick visit to your local rock 'n' roll audio contractor will acquaint you with the types and sizes of traveling rack cases to be had). The sensitive (engineer-only) equipment should be protected by flip-down, hinged panels of transparent Plexiglas, where it can be viewed but not easily touched. Surround the units with several pieces of computer furniture to create the appearance of a station control room. Electronic cabling and setup should be minimized by using multiconductor cabling and connectors. Different types of connectors and polarized ends prevent setup errors and damage.

Safe mast operation is always the first concern. This mast is obviously too close to the overhead power lines and presents a safety risk.

With the technological options available today, any station, regardless of format or budget, can carry out some type of remote broadcasts. The key is to mix and match various components and systems to find the perfect remote kits to suit your needs.

Allan Soifer is a freelance audio designer/recordist and broadcast production consultant in Ottawa, Canada. He can be reached via e-mail at allan.soifer@sympatico.ca.

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

LOW POWER CIRCULAR SERIES

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

MEDIUM POWER CIRCULAR SERIES

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

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

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Remote vehicles

Continued from page 28

is the case, the easiest approach will be to determine the needs of these departments separately. On the technical side, you will need to know what kind of equipment is going to be used. Equipment needs may be basic, requiring just an RPU and cell phone, or they may be more complex, requiring such items as a wireless IFB, multiple power options, and portable PA. Chances are, there will be some means of elevating an antenna for an RPU or other wireless link.

Once you have addressed the needs of the technical department, look at the promotional department's needs. Depending on the size of the station and the budget allowed, this resource may be shared extensively between departments.

Photo courtesy of Allen Osborne Associates.

Sport utility vehicles work well for remote vehicles. This type of vehicle may also fit the station's image.

You will likely need limited hauling capacity for smaller promotional items. If larger promotional devices are used, such as inflatables, tents or games, additional hauling and storage space will be needed.

Once you know the staff's requirements, you must determine what type of vehicle will be needed. Panel vans are a popular choice because of their spacious interiors. Sport utility and all-terrain vehicles are also being used more frequently. The type of vehicle you choose may be influenced by the promotional image it presents; however, function should be the determining factor in your vehicle selection.

At this point, you can begin planning your design. One station vehicle may serve different departmental needs. Be sure to allocate specific areas to each department. This task may be more difficult if one vehicle is serving multiple stations. Once a remote is in progress, the on-air element and on-site element may not mesh smoothly. Allow the air talent to have their space and promotions to have theirs.

What's Inside

The most basic setup will likely be a microphone and RPU transmitter. In many cases, a portable headset radio will suffice for off-air monitoring. A permanent equipment installation may not be necessary in this case. The antenna could be hoisted on a portable mast that is not mounted in the vehicle. These masts have a large plate at the base, and the vehicle is parked on top of the plate to support it. The mast is then raised by hand. Because the only powered equipment is the RPU, the vehicle's cigarette lighter may suffice for power. This arrangement leaves nearly all

Larger vehicles like this RV offer a complete studio with many extras like bathroom facilities. These vehicles can also be used as temporary studios in an emergency.

of the internal space available for promotional uses.

On the opposite side of the spectrum is a complete mobile studio with a control room, console, audio playback sources, generator and a telescoping mast. For this type of remote vehicle, a much larger vehicle, like an RV, is typically used. Most remote vehicles fall somewhere in the middle of these extremes of economy and luxury. The additional equipment needed in more complex installations, such as a small mixer, a power source, audio equipment, a sound system and RPU gear, can be installed in fixed racks or in road cases.

Power to go

Mobile electrical power can be a challenge for any application. Fortunately, most remote equipment does not have excessive power demands. Remote equipment must be small and light, which results in lower power demands. If everything in your system can operate from a 12V power source, you can tap into the vehicle's electrical system. Be sure to calculate the maximum load so you do not overburden the alternator. You can also operate from the vehicle battery alone, but doing so will quickly drain the power and could leave you stranded. In most cases, the vehicle's engine will be left running to power the equipment.

To power devices that require more than 12V or an AC power source, you will need more than the vehicle's battery. Power inverters are available to convert 12vdc to 120VAC. Most inverters do not supply a pure sine-wave signal, and the additional electrical noise is usually transmitted into the audio signal. Another simple option is to use on-site AC power. A shore-power connection will probably be sufficient for all of your needs, but with this method, you will

A small, portable generator can be used for remote power needs.

lose the benefit of having a self-sufficient vehicle.

Portable generators offer plenty of power in a compact size. There are models now that can supply 1000W in about the size of a briefcase. However, you will need to transport gasoline, which presents its own problems. You must also allow for the noise generators create.

One final option combines the power benefits of a generator with the convenience of an inverter. The AuraGen is a 5kW mobile generator mounted in the engine compartment of most vehicles. The power provided is clean and maintains a constant voltage, regardless of the engine speed.

Up in the air

Most remote vehicles have some type of mast. Masts can range from poles to pneumatic, telescoping masts. The height needed depends on the surroundings and the

This large van has considerable internal spaces and an internal generator.

height of the receive antenna. Typical installations use a 28-foot mast. The pneumatic types start at heights of 25 feet. Models are available that extend to nearly 100 feet without guy wires. Manual masts are usually around 30 feet tall.

Permanently installed masts require installation in the vehicle. These masts can be installed on the back of or inside the vehicle. Inside installation requires cutting a hole in the roof. Portable masts require no special installation, but their use does require physical labor. Manual masts use locking mechanisms to hold the sections in place. Pneumatic masts, as the name implies, use compressed air. Both the mast and air compressor require regular maintenance.

Manufacturers of pneumatic masts recommend that they be cleaned every three to four months. Wipe the exterior surface with a soft cloth and a little lacquer thinner. This will remove the oil buildup and any metal particles that are left behind. If the compressor does not have an automatic oiling mechanism, lubricate the mast with mast oil at the same interval. It is also recommended that a mast be disassembled and thoroughly cleaned inside every year. This step, however, is rarely taken until seals need to be replaced or the dirt buildup impairs the mast's operation. In time, a mast will no longer lower under its own weight with the pressure relieved because of dirt and oil buildup.

Emergency vehicles typically have mast-mounted lighting. The masts used in these applications are not usually as tall the broadcast versions. They also do not require a roof pen-

etration. The mast folds down instead of telescoping within the vehicle. Although overall vehicle height can be reduced with this method, you will sacrifice some usable height. Depending on the location of your receiver, this height loss may not be a problem.

Regardless of the type of mast selected, fully training the mast operator in its proper use is crucial. Overhead power lines pose the biggest danger of using any kind of mast. Before raising any mast, the operator should completely circle the vehicle, making sure there is absolutely nothing overhead, then looking for nearby obstacles. All masts will sway to some degree once raised, and even though it is clear directly overhead, power lines in the immediate vicinity can still be a hazard.

When time is short, careless mistakes can be made. Spend plenty of time training your operators so you can be certain they fully understand the importance of safety. No remote event or news coverage is worth the loss of someone's life.

Be sure each staff member is fully aware of all the proper safety procedures before they take the vehicle out for an appearance.

Many factors go into creating the right remote vehicle for a station. If you take the time in the planning stages to properly design your vehicle, you will end up with a resource that helps you promote your station in the community and serves the station well for years to come.

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THE RIGHT MIC

To get the recording job done right, look to the first element in your broadcast chain — your microphone.

By Brian Sanders

Microphones are a lot like aircraft: Each design and type was developed in response to a particular need or to serve a particular function. Although the basic job of collecting sound is accomplished in many ways, using a task-specific tool can dramatically affect quality.

The microphone is the essential radio tool, but it is often taken for granted. We use mics on the air and in the production studio for voice-over work. We also use them to interview the man on the street, to record music and to create sound effects. We have taken mics water-skiing, to the zoo and to war. They must work under many different and extreme conditions yet be standard enough to plug into anything labeled *mic input*. Many of the top designs have been around for years. Today, there are more than a thousand different kinds of microphones from which to choose.

What it is

The microphone is a transducer, a class of device that converts energy from one form to another — in this case from acoustic energy (sound) to electricity. (Speakers and headphones are also transducers; they work like microphones in reverse.) Mics are the first and perhaps most important element in your broadcast chain. An engineer might organize them by method of operation. Nearly all mics are classified as dynamic, condenser or ribbon.

The simplest is the dynamic, or moving coil, microphone. In this design, a sound pressure wave contacts a flexible diaphragm, causing it to move in concert with the wave. A coil of wire attached to this diaphragm is suspended between the poles of a magnet. As the coil moves within this magnetic field, a voltage is created analogous to the sound wave. Dynamic mics are rugged, have very low self-noise and provide a good sound at a modest price.

The condenser microphone takes its name from the old word for capacitor, which is how these mics work. Forming this condenser are two oppositely charged plates, one fixed and the other moveable. These plates are separated by an air space. As sound waves contact the moveable plate, pushing it closer to its mate, the capacitance increases, thus generating a voltage. This tiny impulse is amplified within the mic even before the signal reaches the console. The original tube-amp designs necessitated large mic bodies and a means of powering the amplifier and charging the plates. Solid-state designs allow smaller mics, and phantom power eliminates the outboard power supplies required in earlier models.

Ribbon microphones dominated radio in the 1930s and '40s, and they're making a comeback today. In place of the diaphragm, this mic employs a thin corrugated metal strip suspended between poles of a magnet. Sound waves set the ribbon into motion and the resulting voltage corresponds to the sound. Early designs had a warm sound, were

good for voice work and exhibited good transient response. Although they were quite fragile as a class, classic models such as the RCA 77-DX and the 44-BX were studio workhorses during the golden age of radio.

Because they present such a slim profile to sounds coming from either side, ribbons are inherently bidirectional (or figure eight). Dynamic and condenser microphones, because they operate by sensing atmospheric pressure changes caused by sound waves, are inherently omnidirectional but can be given directionality with physical and electronic treatment. Cardioid, or unidirectional, mics are most common today. These polar patterns are another important way to describe mic families.

Making the right choice

In choosing a microphone for a known task, consider the pickup patterns of various mics. An omnidirectional mic is equally sensitive to sound in all directions (see Figure 1). Regardless of aim, it "hears" in all directions. Cardioid mics are more sensitive to sounds coming from the front. By properly aiming these directional mics, unwanted sounds are minimized. Be aware however, that this directionality is not perfect and that, when dealing with low frequencies, most cardioids act like omnis (see Figure 2). Bidirectional mics are sensitive at the front and back, but have strong nulls to the side. These nulls are useful in difficult micing situations and form the basis for stereo mid-side (M-S) techniques.

Dynamic mics and some condenser mics are given directionality by an ingenious system of acoustic phase-shifting. Vents in the mic body allow sound to contact the diaphragm via routes of different path lengths. These tuned ports cause acoustic phase cancellation at the diaphragm and are responsible for the mic's front-to-back discrimination.

Other condensers generate directionality by adding a second moving plate within the diaphragm capsule. The polarizing voltage and the polarity for this second plate are variable, thus creating the desired polar pattern.

Common and uncommon

Most microphones in common broadcast use are medium-sized dynamics or condensers with cardioid patterns, but unusual applications call for special-purpose mics. Specialty-use mics can eliminate headaches and let you go new places.

Stereo micing requires two microphones. A stereo mic combines two pickup elements in one body. Use a basic stereo mic to capture location sound for news or feature backgrounds. Sophisticated systems are appropriate for serious music recording. The most elaborate systems offer selectable remote control pickup patterns as well as flat frequency response.

Some mic designers offer systems that include a mic pre-amp and several dedicated capsules of various patterns. This screw-on modular design makes for greater versatility, given that each capsule is optimized for a given pattern.

Large diaphragm condenser mics are finding more usage in radio studios.

Highly directional *shotgun* mics are able to reject off-axis sound and are at home where working distance to the source is great. They do double duty at football games, with some covering play action and others aimed at the crowd. Other types are common in the voice-over studio for their flattering sonics and relative immunity from poor studio acoustics. One drawback to this type of mic is that it has a very tight polar pattern. If the source moves too far from the center of pickup, it will aurally disappear. We'll look at this more in a moment.

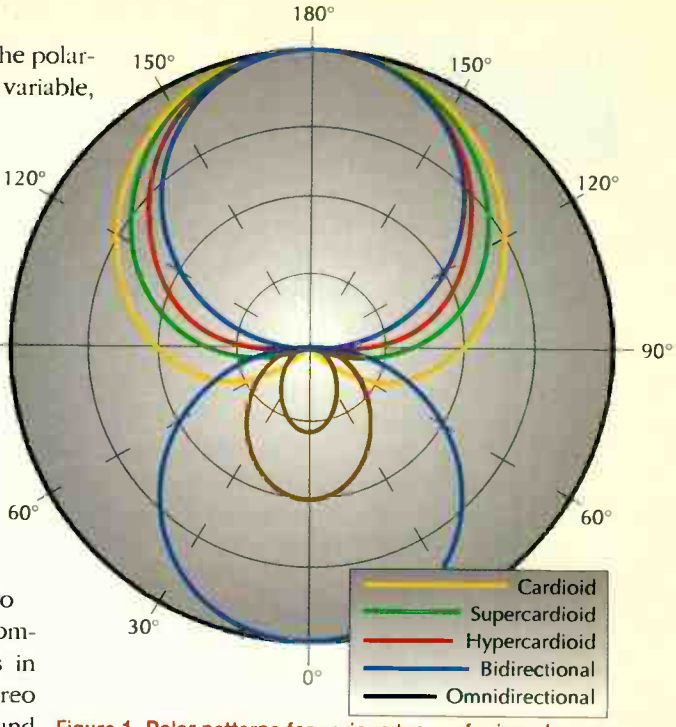

Figure 1. Polar patterns for various types of microphones.

Lavalieres can be placed close to the sound source or directly on the performer. Their small size also helps make them extremely accurate. A radio reporter gathering sound from a moving subject would look to a wireless lavaliere. Go for a lavaliere if your interview subject is mic-shy. They'll forget it's there.

One other possible option is a wireless mic. The pickup element for a wireless mic can fall into one of the categories being discussed here. The wireless aspect has many considerations as well. You probably won't need a wireless for the studio, but they are a staple for field use and remotes. A diversity receiver (see page 42) will improve wireless performance.

More choices

One feature of medium- to high-end mics is a selectable pickup pattern. Typical choices are omni, one or more cardioid settings, and figure eight. Some highly sophisticated mics control pattern electronically, incrementally from omni to figure eight. These can be expensive, but they are a good choice when money is no object and quality is desired.

Even with today's advances in microphone technology, some inherent problems remain. The phase-shift network that creates directionality in mics can also work against you. Proximity

effect is an apparent increase in bass response caused by the mic being too close to the sound source. (Actually, at close range it is the high-frequency information being cancelled, leaving a muddy, bass-heavy result.) Many mics compensate by incorporating a switchable high-pass equalizer circuit to reduce bass response and restore a natural quality.

The frequency response of a particular mic determines its tonal character, and the engineer is always interested in proper mic selection for a given sound. Choosing a mic with exceptional bass response to record a piccolo wouldn't make sense. Microphones flattering to voice often have a response peak to enhance the vocal range. Other designs offer this presence peak as a switchable option.

Off-axis coloration is another microphone distortion to be aware of. The more a directional mic points away from a sound source, the greater the frequency response changes.

The AKG C414B has a four-position switchable polar pattern.

These changes are often unequal at different frequencies, and this ragged response can be highly undesirable. Familiarity with each mic's off-axis characteristics is useful for placing the mic at its primary target and for situating other instruments nearby.

From your standpoint as the microphone user, think of mics grouped by application. The largest user groups are typically announcers and field reporters, although some stations produce live music programming as well.

What to look for in an announcer mic depends greatly upon whom you ask. Men might favor the big, round, manly bass tones characteristic of some mics. Women are sometimes plagued with excessive high-frequency sibilance response. Outboard signal processing can address both situations, but choosing the right mic and using correct placement is basic. We would prefer that listeners not hear us shuffling paper, squeaking chairs and punching buttons. Therefore, cardioid patterns are the hands-down choice here. Rugged (meaning "jock-proof") large-body dynamics such as EV's RE-20 and ND-27 or Shure's SM-7A seem to dominate the industry. But we're also seeing more large-diaphragm condenser mics from companies such as Neumann, AKG and Rode.

In-studio guests present a slightly different set of microphone requirements. Most guests are unfamiliar

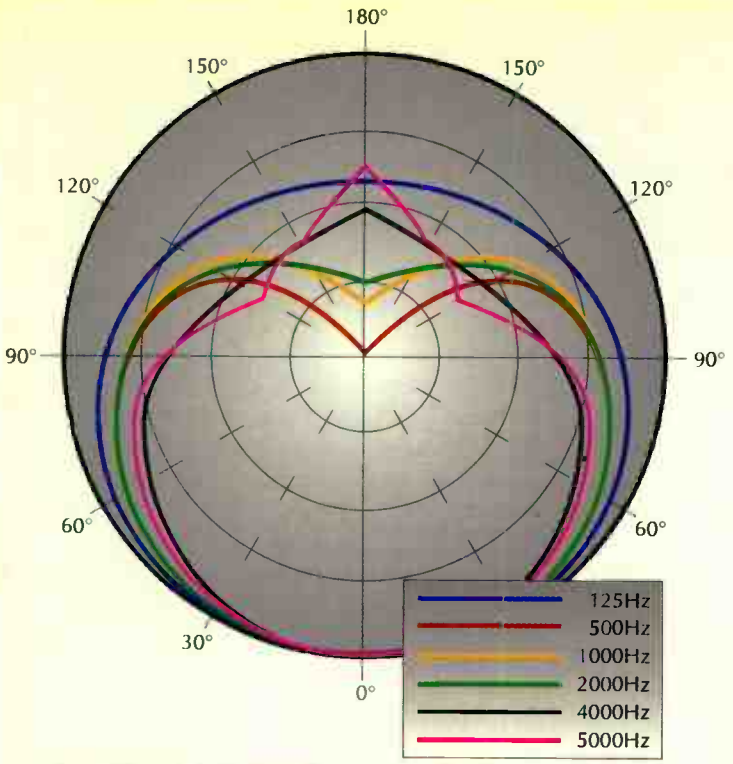

Figure 2. A cardioid mic pattern changes directionality at different frequencies. At low frequencies, it may be almost omnidirectional.

with how to address a mic. A wide pickup pattern, reduced susceptibility to p-popping, and a smaller, less intimidating mic body will all work to your advantage. If you simulcast television, you have even more reason to go small. Miniature mics stay out of the way and sound great.

Broadcast newsgathering imposes some tremendous requirements for microphones. They must not only sound good, ENG mics must also be extremely rugged and impervious to the environmental extremes of heat, cold, wind, rain and humidity. (Think live hurricane updates on the Weather Channel.) These mics are nearly always handheld, so they must reject handling noise well. Go with omnis for interviews, stand-ups and podium mounts. Yours might be one of a dozen mics at a press conference and an omni is more forgiving placement-wise. There are several popular models used in this application. Some also have internal shock absorbers.

Staying at home

If your station is airing live, in-studio music, you've already discovered how your microphone choices affect the resulting audio quality. A versatile kit with a variety of mic types is essential to cover a range of musical styles.

Pick your mics according to need. Of course, budget is often the determining factor in assembling your studio mic closet. At a minimum, you will want a couple of large diaphragm multipattern studio condensers, several more small condensers, and a number of basic dynamics. (Don't forget a few direct boxes, too.) Recently, the mic market has virtually exploded with new designs at both price extremes, with significant additions in the $1,000 or less category. What's interesting about the new mics is that many quality products come from small companies dedicated to just a few designs. Many of the new designs also incorporate tube technology, reversing the

THE RIGHT MIC

emphasis on solid-state components that were prevalent in the previous generation of mics.

Basic accessories are extra with some mics. Don't skimp here. Windscreens for your vocal mics minimize pop effects and help keep airborne dust and other contaminants from reaching the sensitive innards of the mic. They also help cushion the mic from drop impact. Shock mounts can carry a shocking price tag, but they are essential to isolate the mic from mechanical vibrations. They also can be an aid in proper placement.

If you are choosing a high-quality microphone, consider a dedicated mic pre-amp. Like mics, price and quality vary tremendously from a few hundred dollars to several thousand. If your production studio business goes into fine music recording and critical voice-over work, leave some budget for at least a couple of channels of mic pre-amp.

The three most important considerations in choosing a microphone are function, function and budget. Each application will set up a series of considerations leading toward a particular category and class of mic. Many mics can sound good in each job. The idea is to find the one that sounds great. Or as my grandmother used to say, "There's more than one way to skin a cat." I don't want to think what that would sound like.

Brian Sanders is program director for KUNV-FM, Las Vegas, NV.

What is a diversity receiver?

By Uwe Sattler

There are several design options for increasing the reliability of radio transmissions. For receivers, the diversity architecture is the most obvious one.

Radio signals from a transmitter arrive at the receiving site along constantly changing multiple paths. Reflections from boundaries and obstacles are superimposed on the direct signals and other reflected signals. Depending on the phase relationships, the signals may reinforce or attenuate the resulting signal sum at the receiver input.

Figure 3 depicts in red-and-blue traces how the signal picked up at two different receiver locations may fluctuate with the transmitter's movement over time. These fluctuations occur even with relatively small changes in transmitter position. The signal may frequently drop below the minimum level required for interference-free reception.

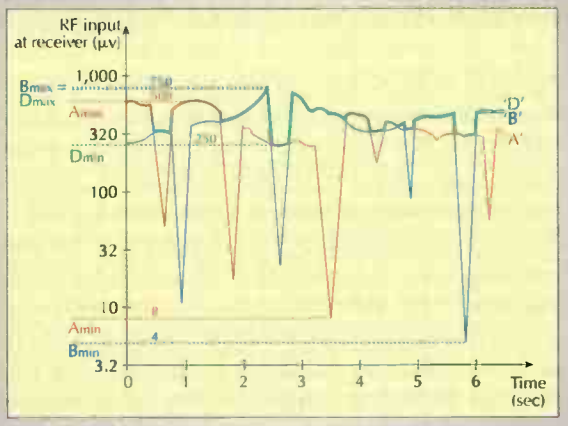

Figure 3. Automatically selecting the stronger received signal allows a higher-quality audio signal to be maintained.

In true diversity, two complete receivers with spatially separate antennas pick up the radio signal from the same transmitter. A comparison circuit connecting the receivers evaluates the RF-signal strength and instantly selects the output from the one with the stronger signal.

This solution provides a significant improvement in the average received signal level. During the observed time in the graphed example, the signal at antenna site A fluctuates between approximately 8µV and 500µV, or by 36dB, while at antenna site B, the variation is an even greater 45dB, from 4µV to 750µV.

The diversity principle keeps the effective composite input signal between 250µV and 750µV, for a difference of only 10dB. This is equivalent to a signal improvement of 26dB or 35dB in sides A and B respectively.

Uwe Sattler is technical manager for Sennheiser Electronic Corporation.

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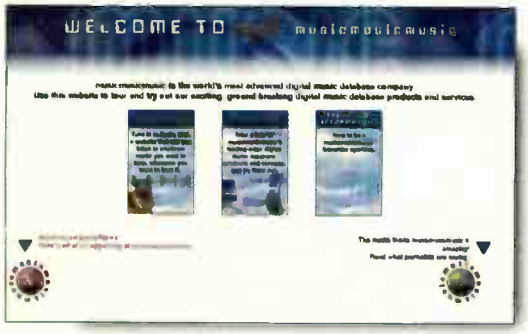

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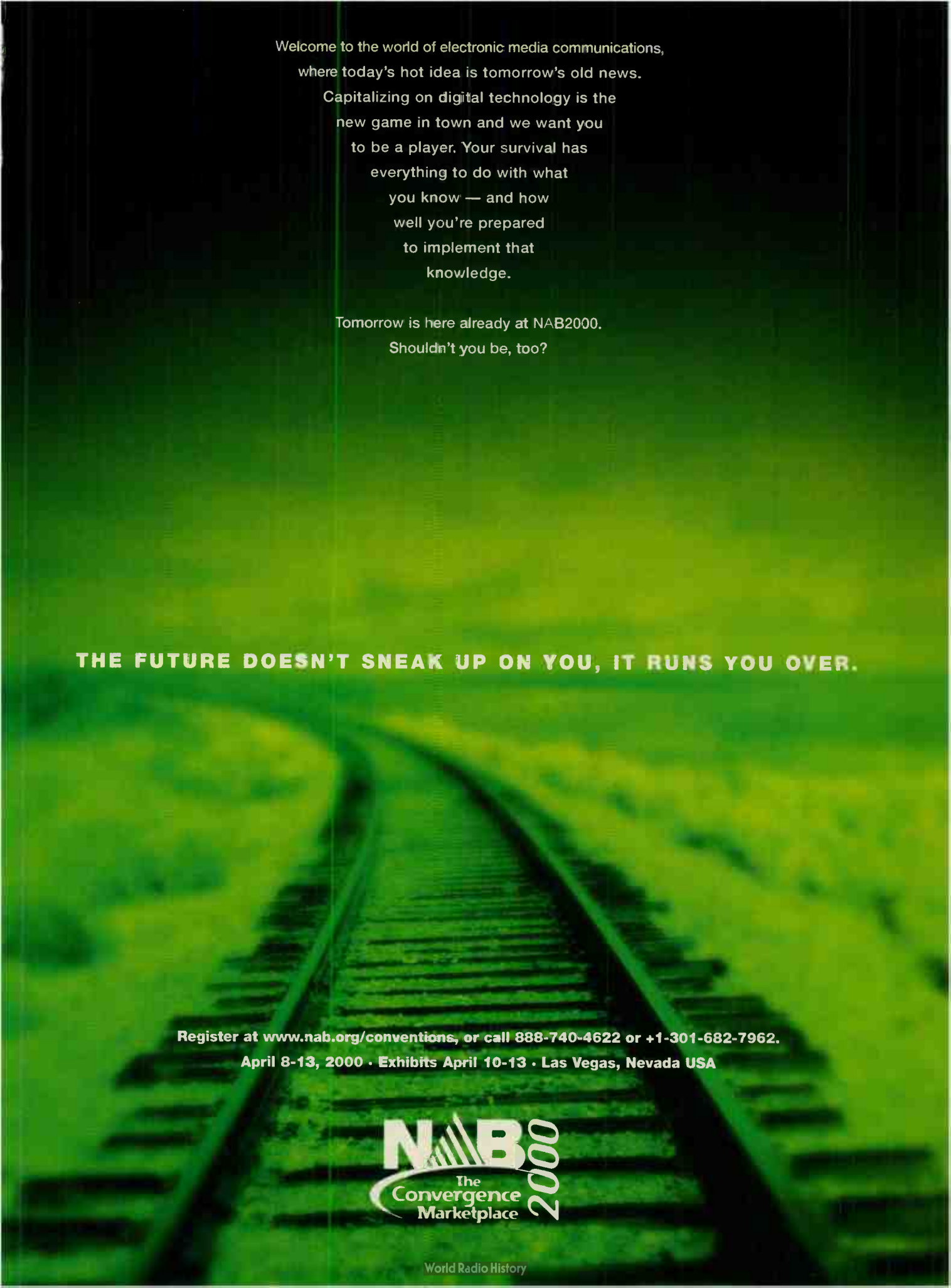
Shure

▼ **SCM410:** This four-channel automatic mixer is suited for smaller installed and transportable systems. Has many of the performance attributes of Shure's eight-channel SCM810 mixer pulled into half of a rack space. Features

include adjustable low-pass filters (25Hz to 320Hz), high-frequency shelving filters for each channel, four balanced XLR inputs, a single balanced XLR output, an unbalanced RCA auxiliary-level output, a peak output limiter and master output level control.

800-25-SHURE; fax 847-866-2279; www.shure.com
marcom@shure.com
Circle (251) on Free Info Card



New Products

Signal router/monitor
Furman Sound

SRM-80: Provides a way to manage mixdown and dubbing in a single product. Offers signal routing and monitoring for four stereo devices, plus the main console output. Simplifies mixdown and dubbing between different media types without tying up additional console channels. Multiple copies can all be made simultaneously through use of the unit's Source Select switches. A/B/C listening comparisons can be made between three different speaker types, and all gains are front-panel adjustable for equal loudness when switching between speaker pairs. Accommodates one amplifier driving two unpowered speaker pairs, and a line level signal driving one self-powered pair. Provides an internal, high-power headphone amp.

707-763-1010; fax 707-763-1310; www.furmansound.com; info@furmansound.com

Circle (267) on Free Info Card

Portable PA system
D.A.S. Audio/Sennheiser

Speaker On A Stick: A complete, self-contained sound system designed for high-quality, compact, transportable PA. Comprises one D.A.S. DS15A self-powered loudspeaker, one Sennheiser E835 Evolution Series cardioid vocal microphone, one SS1 heavy-duty aluminum, tripod speaker stand, one PM200 high-quality mic stand with boom-arm and one 21-inch MC21 mic cable.

860-434-9190; fax 860-434-1759; www.sennheiserusa.com; lit@sennheiserusa.com

Circle (273) on Free Info Card

Sample rate converter
Lucid

SRC9624: Provides real-time, asynchronous sample-rate conversion for recording, mastering and post. Users can connect almost any kind of two-channel digital audio device, regardless of I/O format or sample rate. Will lock to all sample rates between 32kHz and 100kHz, including varispeed and common pull-up and pull-down rates. Offers both types of I/O connections used for 96kHz audio. Outfitted with single-wire and dual-wire 96kHz connections, the unit can transmit and receive high-definition signals of either format. Comes with an Independent mode for converting the sample rate of two AES3 streams to any standard common output rate. Coaxial AES3-S/PDIF and optical S/PDIF input and output connectors permit the connection of a wide range of equipment operating at different sample

425-742-1518; fax 425-787-3211
www.lucidaudio.com
lucid@lucidtechnology.com

Circle (268) on Free Info Card

New Products

Digital input card
Gage Applied Sciences

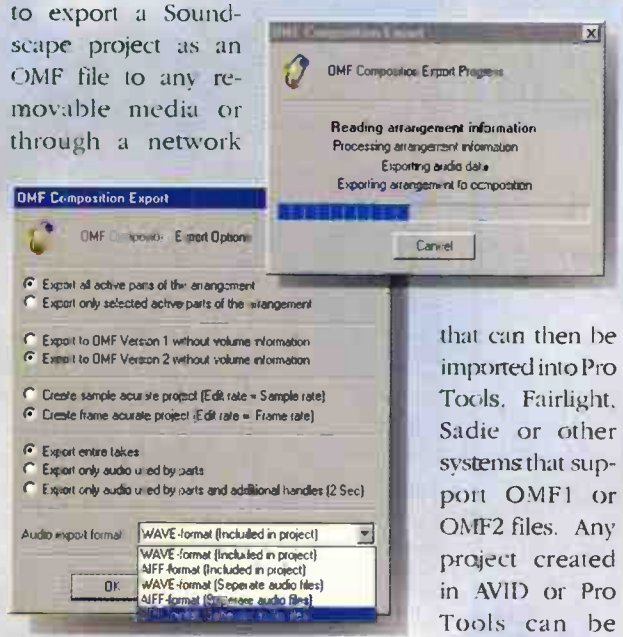
▲ **CompuScope 3200:** Single-slot PCI bus card capable of performing 32-bit digital data acquisition of TTL, CMOS or ECL into onboard memory at up to 100MHz

clock rate. Inputs can be ordered as differential or single-ended. Can be configured in software to be 8, 16 or 32 bits wide, allowing maximum use of storage memory for 8- or 16-bit inputs. Can be used to stream data across the PCI bus into host memory, making it possible to capture gigabytes of gapless digital data.

800-567-4243; fax 800-780-8411; www.gage-applied.com
prodinfo@gage-applied.com
Circle (250) on Free Info Card

OMFI import/export plug-in
Soundscape

▼ **Plug-in for R.Ed:** A plug-in for the R.Ed Recorder Editor and SSHDR1-Plus editing systems that allows users to export a Soundscape project as an OMF file to any removable media or through a network



that can then be imported into Pro Tools, Fairlight, Sadie or other systems that support OMF1 or OMF2 files. Any project created in AVID or Pro Tools can be loaded into R.ED or SSHDR1-Plus for editing. The OMF Import/ Export Function is included in the Soundscape EDL Processor (free for existing users) but can be purchased separately at lower cost for those who do not require auto conforming for video.

805-658-7375; fax 805-658-6395
www.soundscape-digital.com
us-sales@soundscape-digital.com
Circle (269) on Free Info Card

New Products

Headphone amp
Sonifex Ltd

▼ **RB-HD6:** Distributes stereo audio to up to six different sets of headphones, each with its own volume control. Can receive an override audio signal via a jack for each output channel. Plugging in the jack plug will divert the headphone output from the master audio signal to the audio present on the jack plug. The master volume control adjusts overall level of the six outputs and a stereo/mono input select switch sums left and right outputs for a mono input.

+44 1933 650 700; fax +44 1933 650 726
www.sonifex.co.uk; sales@sonifex.co.uk
Circle (270) on Free Info Card

Low-cost 8x CDR
Quantegy

Silver CDR: The Silver CDR is aimed at users who want a quick turnaround time at the right price. The offering is an addition to the CDR line, which already encompasses the premium Gold CDR, a full line of printable CDRs and a line of mid-range CDRs that includes the Silver and Gold.

800-752-0732; fax 334-742-6091
www.quantegy.com; webmaster@quantegy.com
Circle (258) on Free Info Card

Dual vacuum tube pre-amp
dbx Professional Products

386: Combines vacuum tubes with dbx's proprietary Type IV conversion system. Has rates of 44.1, 48, 88.2 and 96kHz. Digital outputs offer the ability to communicate in 16-, 20- or 24-bit word lengths. Includes a high-impedance, ¼-inch instrument input on the front panel, as well as a mic/line switch and 20dB pad. Analog and digital outputs feature independent controls. 12-segment LED meters provide a visual indication of analog or digital levels at glance. Rear panel includes mic and line inputs and outputs, word clock sync input and output, and digital outputs. Two hand-selected and matched premium 12AU7 vacuum tubes ensure ideal triode gain matching, distortion, microphones and drive characteristics.

801-568-7660; fax 801-568-7662
www.dbxpro.com
customer@dbxpro.com
Circle (264) on Free Info Card

3.5-inch magneto-optical disks
HHB Communications

▼ **MO 640MB DOW:** Delivers dramatically increased write speeds by enabling new data to be directly overwritten in a single pass. A precision sputtered MO thin film on a polycarbonate substrate ensures low block-error rates, a high carrier-to-noise ratio and more than 1 million rewrite cycles. An antistatic hard coating repels dust from the disk surface, helping to deliver a secure archival life of more than 30 years.

310-319-1111; fax 310-319-1311
www.hhb.co.uk; sales@hhbusa.com
Circle (265) on Free Info Card

New Products

Natural-sounding harmonizer

DigiTech

▼ **Vocalist VR:** Patented harmony algorithm allows the unit to maintain all of the characteristics of a singer's voice for realistic-sounding backup vocals. Allows users to choose between chordal or scalic harmonies, select the key and scale, determine whether the harmonies are below or above their voices, assign individual mix levels for their voices and the harmonies, and add warm reverbs.

801-566-8800; fax 801-566-7005; www.digitech.com: support@digitech.com

Circle (255) on Free Info Card

Digital software solution

Management Data

Broadcast Studio 3.0: Encompasses modules for archiving news, production, scheduling, music rotation, on-air broadcasting, trafficing and sales. Provides comprehensive portability and runs as a 32-bit version in standard client-server architectures under UNIX or Windows NT. A central database from Oracle, Informix or any other ODBC-compatible standard makes it possible to access all stored audio files, music, commercials, jingles and news from other locations.

212-323-8042; fax 212-943-2300; www.mdbroadcast.com

Circle (252) on Free Info Card

Sample rate converter

Independent Audio/dCS

972 24/192: The unit has been upgraded to enable it to convert 44.1, 44.88.2, 96, 176.4 and 192kS/s pcm to Sony DSD format. A software update has increased the number of noise shapers from three to 10 and added noise shaped triangular dither to the existing triangular and top-hat options.

207-773-2424; fax 207-773-2422
www.independentaudio.com
info@independentaudio.com; www.dcsltd.co.uk; more@dcsltd.co.uk

Circle (254) on Free Info Card

Hafler Subwoofer

▶**TRM10s:** Trans•ana-powered subwoofer, a down-firing, ported system. Augments the performance of Hafler's TRM6 acvite monitor system or any small monitor where frequency response down to 25Hz is vital. Features MOSFET output stage and class G/trans•ana topology with a 1 cubic-foot vented enclosure. Has a 200W amplifier and oversized power supply for wide dynamic range and a superwood enclosure. Adjustable input sensitivity, adjustable crossover of 24dB/octave Linkwitz/Riley with 40Hz to 110Hz range. Balanced XLR and RCA stereo inputs. Selectable phase control.

602-894-1528; fax 602-894-1528; www.hafler.com;
sales@hafler.com

Circle (277) on Free Info Card

New Products

CD player and auto-reverse cassette
TASCAM

▼ **CD-A700:** Flexible output architecture includes balanced XLR and unbalanced RCA analog I/O and coaxial (S/PDIF) digital output. Features a 12-percent pitch

control and D-sub 15-pin parallel control I/O. The CD and cassette operations work independently of one another except when operating the CD-to-cassette dubbing feature. CD Sync allows for one-button duplication of program material from CD to cassette.

323-726-0303; fax 323-727-7635; www.tascam.com
tascamlit@tascam.com
Circle (257) on Free Info Card

Nearfield monitor
Tannoy

▶ **PROTO J:** Provides high-quality monitoring to those on a budget and where space is at a premium. Extended low-frequency response, controlled dispersion and dynamic character make it ideally suited for 5.1 format project studios. Uses a durable 6.5-inch mid/bass driver and a new ¾-inch high-frequency unit, ideally placed in a front-ported reflex enclosure. Each cabinet employs integral threaded inserts on its rear for easy wall mounting.

519-745-1158; fax 519-745-2364
www.tannoy.com
Circle (275) on Free Info Card

Rack-mount recording console
API

◀ **7600:** This 1RU input module offers studios of all sizes a new range of options without sacrificing sound quality. Features a genuine API mic pre-amp. Uses the same mic pre-amp in the 200 Series Legacy Console module, and an exact reissue of the 550a EQ, offering three bands of API EQ but with seven frequency choices per band. Also has a 225L compressor. Available in either in a horizontal or vertical configuration, the only difference being the legends on the panel. Several modules can be linked together to a 7800 for a complete rack-mount console.

800-642-8063; fax 410-381-5025
www.audiotoys.com;sales@audiotoys.com
Circle (276) on Free Info Card

Broadcast studio furniture
Arrakis

◀ **Modulux Flex-Studio:** A complete, standard modular furniture package that can be shipped quickly from stock for fast on-site assembly in dozens of different ways to meet nearly any studio design. Can be assembled left or right handed, as well as in short L, long L and unbalanced U configurations. All pedestal returns have front equipment racks and rear access doors. The table pedestals have inside and outside access doors. The tabletop equipment pod provides rack-mount space for tabletop equipment.

970-224-2248; fax 970-493-1076
www.arrakis-systems.com;sales@arrakis-systems.com
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The DAButante ball

By Skip Pizzi, executive editor

Each January in Las Vegas, the Consumer Electronics Show opens the year with a look at what's to come in the media hardware marketplace. This harbinger in the desert is a kind of mirror image of the NAB show, which takes place in the same venue each spring. Like a view through an inverted telescope, CES considers the same media services as NAB, but from the receiver's rather than the transmitter's perspective.

This year brought a new concept to CES: digital radio. Though the subject has been heavily discussed in these same halls for the last decade during NAB conventions, CES 2000 was a coming-out party for digital radio in the consumer electronics industry. For the first time, digital radio proponents were talking to consumer retailers about DAB.

CES 2000 was a coming-out party for digital radio in the consumer electronics industry.

The race is on

At conference sessions and on the exhibition floor — in a special new area called the Digital Radio Pavilion — the prospect of digital radio in the U.S. looked real in a way it never has before. Among the purveyors, the most tangible display was created by Sirius Satellite Radio (SSR, formerly CD Radio). SSR's large, two-level booth included a kiosk full of working receivers from a half-dozen familiar car audio manufacturers. Live DJs spun sample shows from a control room overlooking the booth, and plenty of displays and staff talked programming, sales opportunities and technology.

Adjacent to SSR's display was the other satellite radio licensee, XM Satellite Radio. Although some hot cars and slick displays drew crowds there, too, the mood was less electric than that at SSR. XM already seems behind in a number of ways. First, XM will not premiere its service until 2001, while (barring launch failures) SSR will have all its satellites in orbit by the middle of this year. (SSR's receivers will be in stores and car dealerships by Christmas 2000.) Second, XM will use two geostationary satellites, while SSR will have three satellites in *highly elliptical orbit* (HEO). This difference is significant: It places SSR's birds almost directly overhead for the average user in the contiguous 48 states. SSR's service will thus be substantially less reliant on terrestrial repeaters for consistent service, further expediting its service rollout. XM's satellites will be lower on the horizon, like any other GEOsat appears in the U.S.

Terrestrial DAB held a distant third position in the Digital Radio Pavilion. By all appearances, this approach is essentially still a concept — and a somewhat uninteresting one, based on most reactions to floor demos. USA Digital Radio (USADR) and Digital Radio Express (DRE), two DAB proponents that recently merged their efforts, exhibited in the only other booth in the Digital Radio Pavilion. Lucent Digital Radio, the other IBOC proponent, opted out of exhibiting (a late change in plans), choosing instead a small suite just off the show floor for low-key discussions, and turning over its floor space to SSR. Lucent put some of its staff in the SSR booth to talk about that system's use of the Lucent PAC audio coding algorithm, but made no mention of its IBOC system on the floor.

For its part, USADR/DRE showed a greatly improved and impressive-sounding AM IBOC format (transmission simulated in the booth), and an FM format that was actually on the air over a Las Vegas country station. The latter demo would have added a sense of realism to the system for broadcasters, but its use of laboratory-type receivers made it seem unreal to the CES crowd. The large, uncorrected time difference between the analog and digital signals on this demo channel also made direct A/B comparisons difficult, although the digital signal exhibited an obviously wider and more stable stereo image. Nevertheless, IBOC was not getting much attention at the show. While SSR's and XM's booths were usually crowded and buzzing, USADR's seemed like a ghost town, with its staff generally outnumbering its visitors.

Learning curve

The lesson most attendees took away from CES 2000 was that digital radio is coming and that it is a satellite service. Those who were really paying attention might have noticed that there was also such a thing as terrestrial DAB, but its prospects remained uncertain and distant.

Perhaps IBOC will finally make its debut in the real millennial year (2001), or later. Perhaps by then — as it seemed at CES 2000 — no one will care.

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"We're running Digital Universe in the studios 24 hours a day, and loving it!"

–David Brown at KALS Radio

KALS Radio needed to do more at their station without adding people. So they had some demanding criteria for their new live assist system. It had to be easy to use and maintain. Flexible enough to handle multiple program sources. And not something that would trash their audio quality with heavy compression.

David Brown, Program Director, selected Digital Universe.

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"Network Capture is flawlessly recording our satellite programs, and we sound noticeably better on the air."

Its intuitive design makes Digital Universe easy to learn and a breeze to operate. But when KALS has questions, they need answers fast.

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