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June 2000
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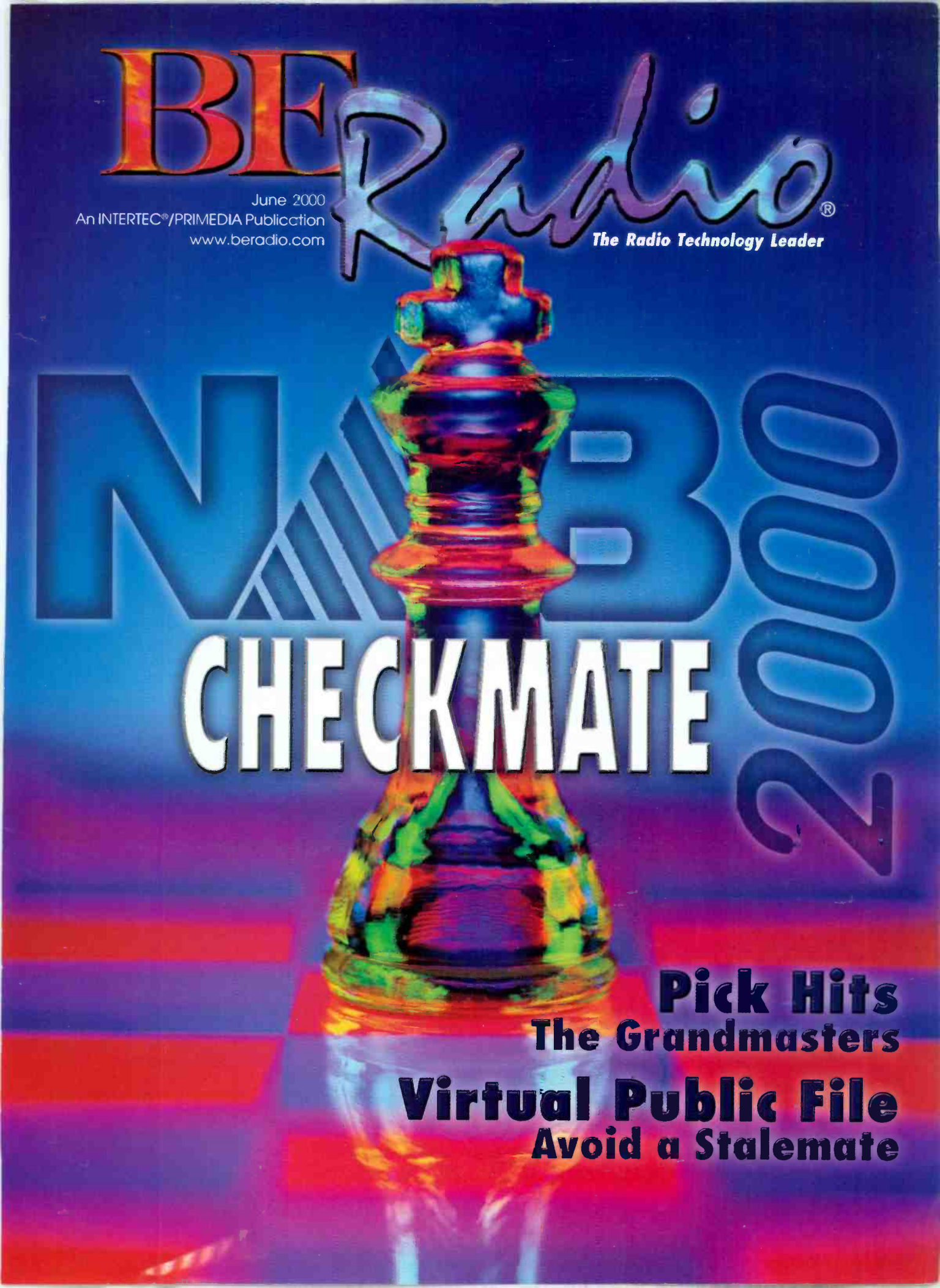


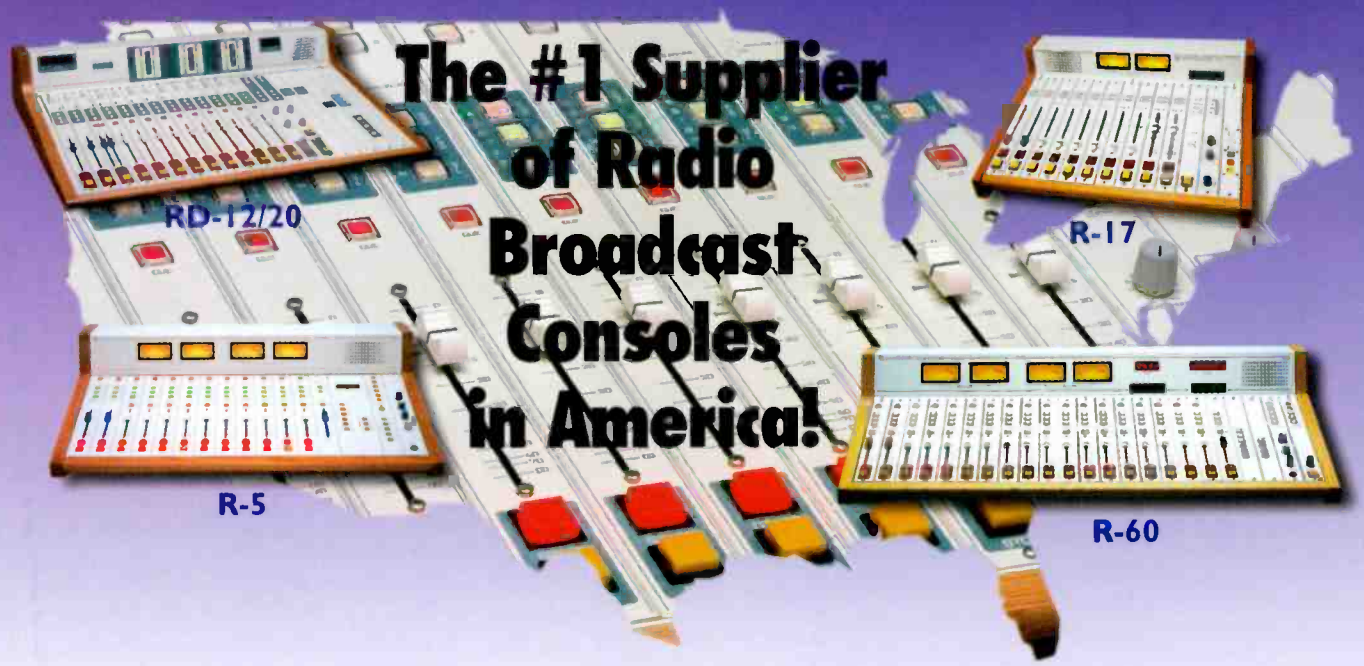
NAB 2000

CHECKMATE

Pick Hits
The Grandmasters

Virtual Public File
Avoid a Stalemate

From Audioarts...



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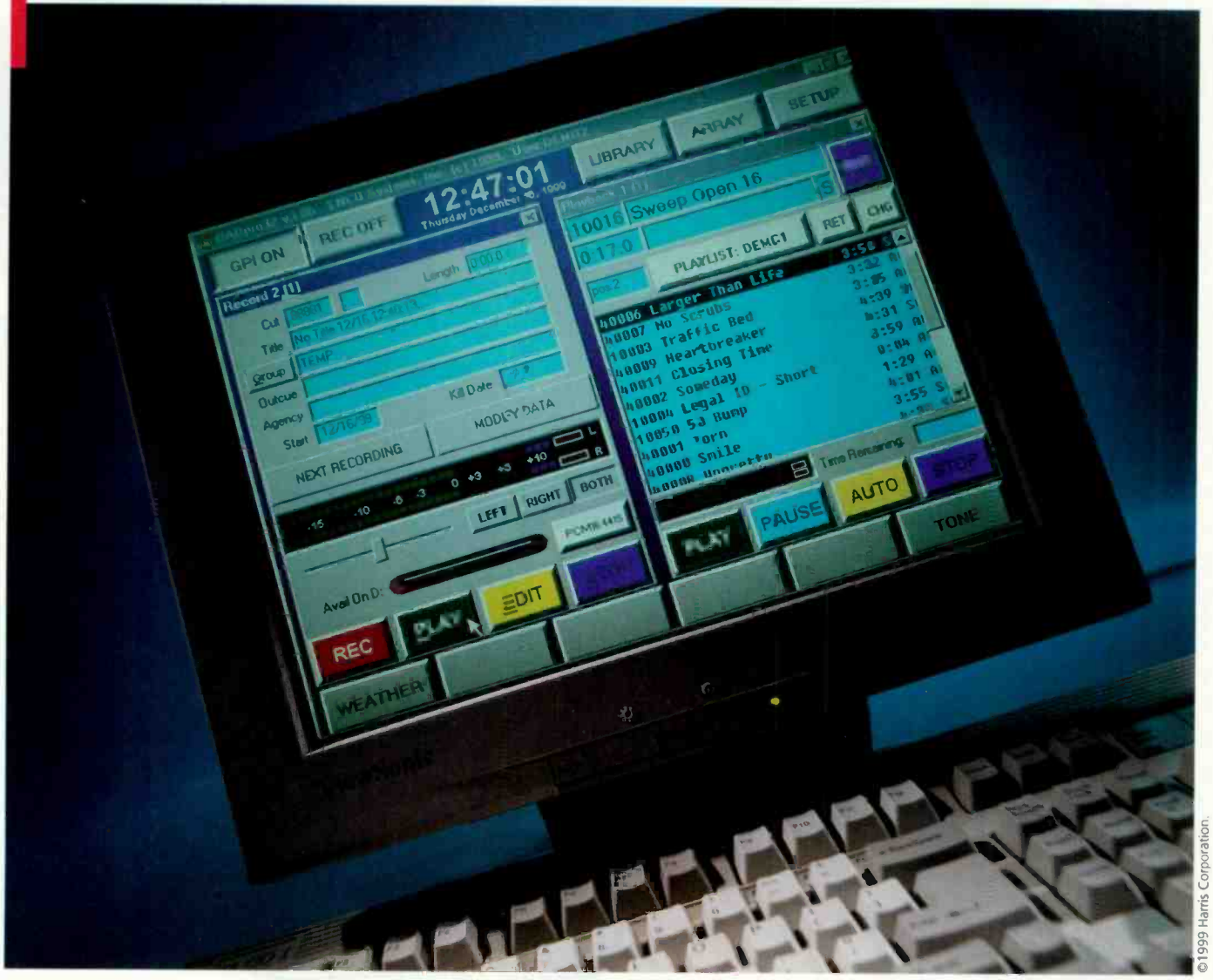

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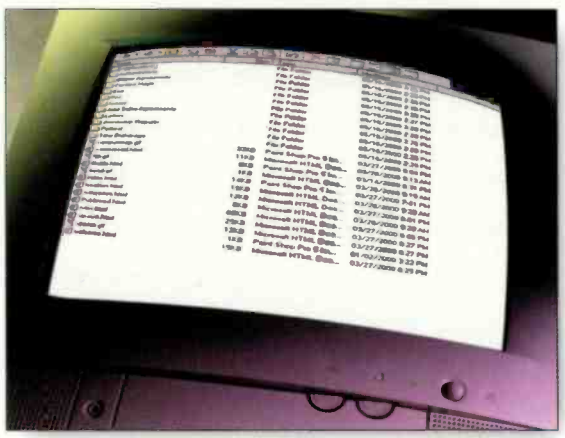

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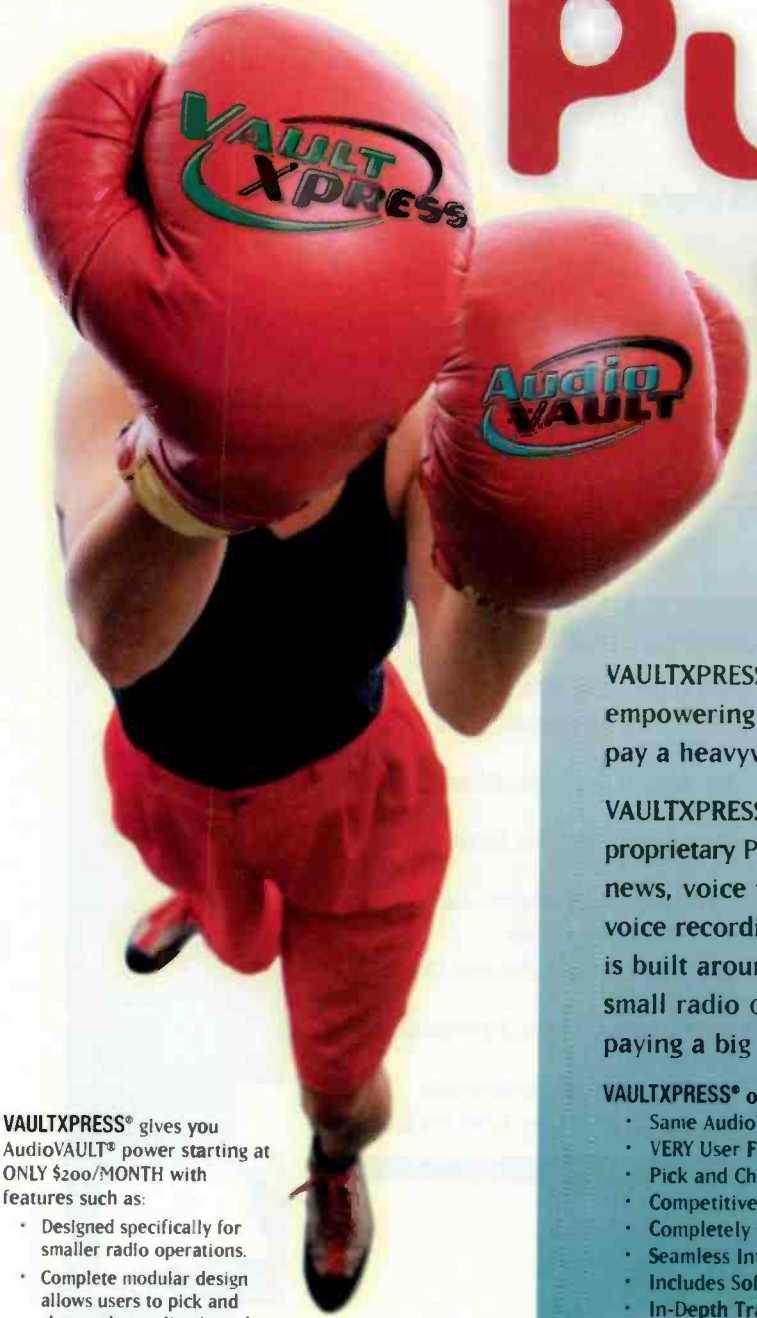

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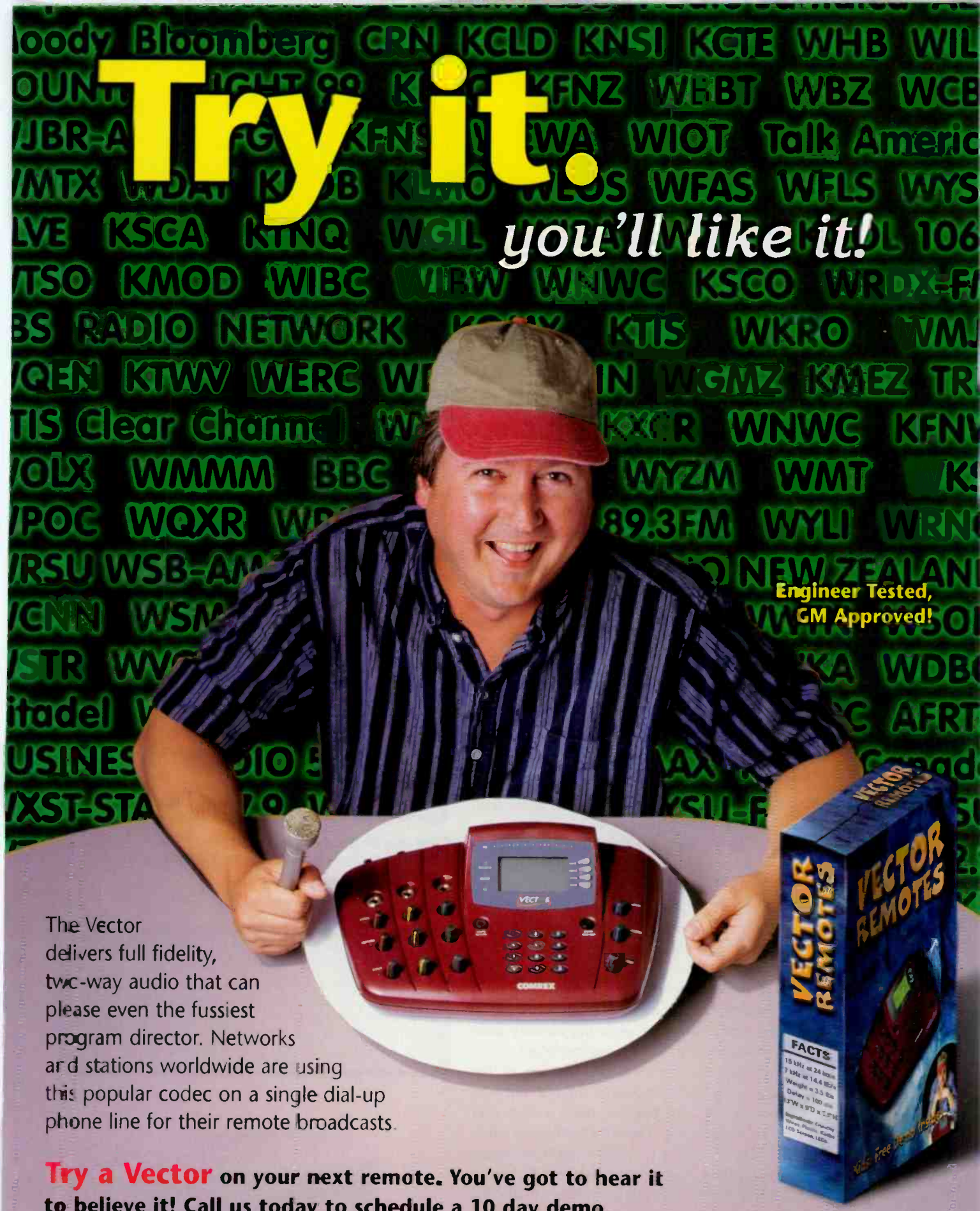

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Replacement radio

Listening to audio over the Internet continues to grow in popularity. In many office buildings, over-the-air reception is not possible. Internet streaming allows listeners in this coveted ratings environment to hear programs from their local stations and some not-so-local sources. The exact number of streaming audio originators — not just radio stations — is difficult to estimate. Many estimates place the number of choices in the low thousands or more.

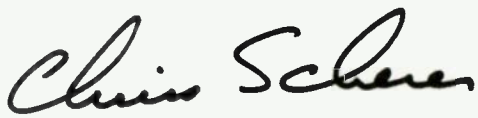
Right now, there is a glut of new dot-com companies due to the ongoing fascination with the Internet. Many of these companies are built on investment capital and have no cash flow at this time. Many are developing sites that fit a tight niche. It is likely that, in time, a large number of these companies will disappear. New streaming-audio originators are emerging in the wake of this fascination. While Internet radio is putting forth a good effort, it does not provide the mobility, localism and spontaneity of conventional radio.

These new online radio stations use the existing broadcast model of delivering an audio feed to a listening audience. While the new listening choices are gaining acceptance, the limitation of a wired connection is still a hindrance. This is being addressed with products designed to retransmit the audio from a sound card to nearby radio receivers. These products work within Part 15 of the FCC Rules. Other products provide a new receiver altogether. Still other companies offer a stand-alone Internet audio appliance. None of these offer true mobility, but all offer a listening environment away from the PC. Wireless Internet products will also assist in giving legs to Internet radio. However, while the mobility issue is being developed, it is far from being perfected.

The localism issue is based on the location of the transmitter and receiver. The nature of the Internet is to cover the entire world. An Internet radio station may attract listeners in the same community where it originates, but it is also accessible to a much larger audience. This scope significantly changes the existing radio broadcast model, and it is one S-DARS providers will also be dealing with.

Listening to the radio involves some uncertainty regarding what will happen next. Not knowing what song will be played or what topic will covered adds an element that keeps the listener's interest. The same listening audience could also play a CD or load some MP3 files, but it is no longer a game of chance. The choices are made and the outcome is known. Internet radio and conventional radio are on a level playing field here. Providers offering audio-on-demand services are not meeting this element of radio listening. There is certainly a market for this type of service. Napster has already demonstrated one variation. This type of service still competes for the listener's attention, but it is based on a different model.

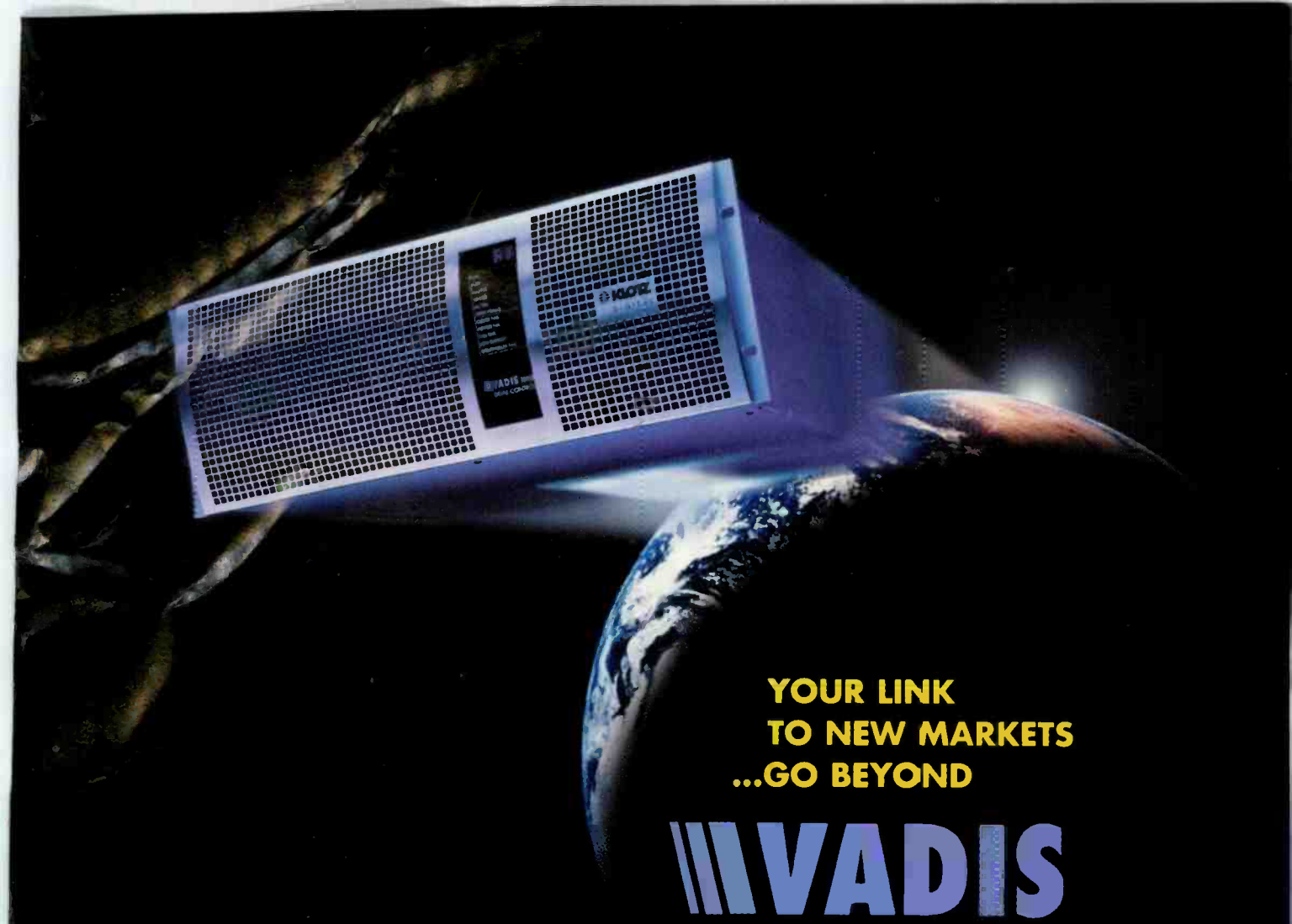
There are times when listeners want to program their own specific choices. However, in the case of radio, listeners prefer to have someone else make those choices. Internet radio stations and audio-on-demand service providers have made statements that these new services will replace broadcast radio. I disagree. I remind these Net prophets that the portable medium with spontaneous, local content has been around for nearly a century. Although economics and programming formulas are currently driving this content, it is not ready to die. It is simply maturing.



Chriss Scherer, editor
chriss_scherer@intertec.com

On the road

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



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Test equipment

By Kirk Harnack

Consider test equipment for a moment. What words come to mind? Expensive, sensitive, calibrated, accurate, fragile and indispensable are terms we commonly associate with test equipment.

We frequently assume test equipment is required to solve problems in broadcast facilities. We think that without an expensive VOM, a fancy oscilloscope, a LAN cable analyzer and a level/distortion meter, we are helpless against broken equipment or systems.

In a few cases, this thinking is valid. However, the majority of system and equipment problems can be diagnosed and repaired without expensive test gear. Moreover, cutting straight to the problem is often faster when you are equipped only with common sense and a few basic tools. This article will demonstrate how to use clear thinking and minimal tools to quickly diagnose broken equipment and systems.

Case study

Situation. Control room air monitor: No audio from left monitor speaker. *Scene.* A multistation facility had suffered a nearby lightning strike about two hours prior to troubleshooting this problem. The left studio monitor speaker is dead; the right one seems to work fine.

Switching the console monitor to PGM results in audio from both speakers, so the speakers' power amp is good, as are the console's monitor outputs. Switching back to Air, the left speaker is silent again.

Opening the console reveals tight connections at the EXT monitor inputs. An inductive amplifier (the *sniffer*, or *hound*, portion of a *fox-and-hound* test set) is used to check for audio on left and right EXT inputs. The right input has plenty of audio present. The left input is silent.

The EXT monitor's source of audio is an AM/FM rack-mount tuner. Disconnecting the RCA plugs from the unit's output jacks allows the sniffer to check for good audio output. Both channels check well at the output jacks on the tuner. We could dispense with the sniffer and simply swap the RCA plugs on the tuner's outputs, but I have the sniffer in hand. If the audio symptoms change when swapping output cables, then the source of trouble must be the tuner. If the trouble stays the same, the problem must be between the tuner and the console input.

It is noted that the tuner's audio outputs are unbalanced connections, but the console's EXT input is connected with balanced wiring. This wiring difference plus the lack of left channel continuity points to a problem between the tuner and console. Then I remember the audio distribution amp (DA). It divides the air feed to a talent headphone amp, music-on-hold, and the console's EXT input.

A moment later, the DA is in my lap, still operating, with the top cover off. The sniffer indicates good audio at the DA's left and right inputs, yet all of the DA's left outputs are silent. The right outputs have proper-sounding audio.

The source of the audio trouble has been narrowed to the DA. We have to decide if the problem is worth troubleshooting further. Some broadcasters have plenty of spare equipment ready for use on a moment's notice. No spare DAs were at this station, so I decided to press on.

A quick yet careful inspection of the components and circuit board does not reveal any obvious problems. After a lightning strike, you will likely find telltale signs of damage.

Carefully touching a few select components may identify which ones are overheated. Compare the relative temperature of working ICs with those included in suspect portions of the equipment. Most ICs will be at least a little warm to the touch. However, if it is too hot to leave your finger on the package, the device may be drawing excessive current. This DA is not giving up temperature clues, however. All the ICs are warmer than ambient, but none is hot.

This is the point where experience and common sense can merge for quick and effective problem-solving. There is no manual handy for this DA. However, the architecture of a typical 2×16 (two 1×8s) DA is very straightforward. The left and right channel circuits are laid out somewhat symmetrically. By comparing the working right channel with the nonworking left channel, it is not difficult to track down where the audio is stopping on the left side.

The *fox-and-hound* set

The most useful test equipment I have is a tone generator and inductive amplifier, also known as a fox-and-hound set. The tone generator can output a constant tone or a warble tone. It offers alligator clips on its output leads as well as an RJ-11 plug output for connection to telephone cabling. The inductive amplifier has a metal probe, power button and speaker. When activated, the speaker allows listening to whatever audio-range signal may be present on the probe. The unit's pickup is inductive and the amplifier gain is high enough that direct contact with a signal-carrying conductor is not required. This allows listening to audio on wires without having to actually connect to them. With a little practice, an audio *sniffer* can be used for basic checks of ISDN lines, AES audio circuits and plenty of other items. These test are intended to be neither exhaustive nor conclusive, but often they don't need to be.

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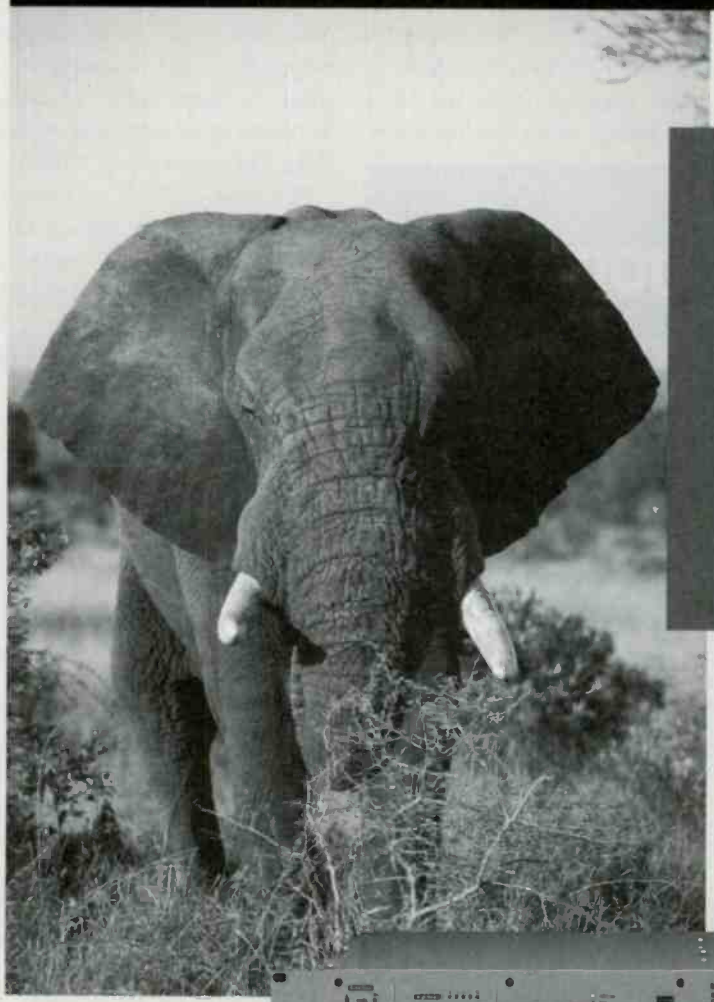

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This circuit tracing leads to what appears to be one of two input ICs, identified as a TL084. Powering the unit off, I swap the two TL084 ICs and repower. We now have audio in the left speaker, but not in the right. Symptom swapped; problem found.

My old parts kit does not have any TL084 ICs, so I quickly search the Internet using that part number. The Texas Instruments website has all of the pertinent information, including pinouts and a description indicating this IC is a quad JFET opamp.

I recall seeing a plastic bag in my parts kit labeled *Quad JFET Op Amp*. A pinout and supply voltage comparison indicate that it will probably work fine in this circuit. A few moments later, after replacing the bad part and reassembly of the DA, all works fine with the control room air monitor. I also use the sniffer to check for any obvious DC offset in the audio outputs, since this is a common failure mode for op amps.

Time economics

The total time for finding and repairing this problem is less than 15 minutes — quite a bit faster troubleshooting than when I started in broadcast engineering. Total test equipment used: one inductive amplifier (not the arsenal of test gear I used to rely on). What made the difference? Was this repair work sloppy? Not when the unit's function is considered. Is there more to quick and accurate diagnostic and repair work than just experience? I think so.

The most valuable information one can learn about a circuit, device or system is how it is supposed to work. Knowing what a device does, how it does it and why it is doing it are keys to pinpointing problems and solving them.

A former employee and associate exemplified the art of accurate troubleshooting using the simple tools and indications at hand. His assignments usually involved solving our clients' most complex and enigmatic engineering problems, and he had the least test equipment of any engineer in our group.

His analysis of each engineering problem started with the question, "What is it we are trying to do here?" Answering that question on both a broad and a detailed level had the effect of focusing his thoughts for proper troubleshooting.

Expensive test equipment is sometimes necessary to locate the root of a problem or to quantify certain parameters that must be known. However, the finest and most versatile piece of test gear available is close at hand to every broadcast engineer. It's equipped with aural and visual sensors, among others. Its capacity for storage is virtually limitless. It is powerful when properly programmed and software updates occur every day. Best of all, it is conveniently located just above and between your shoulders.

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

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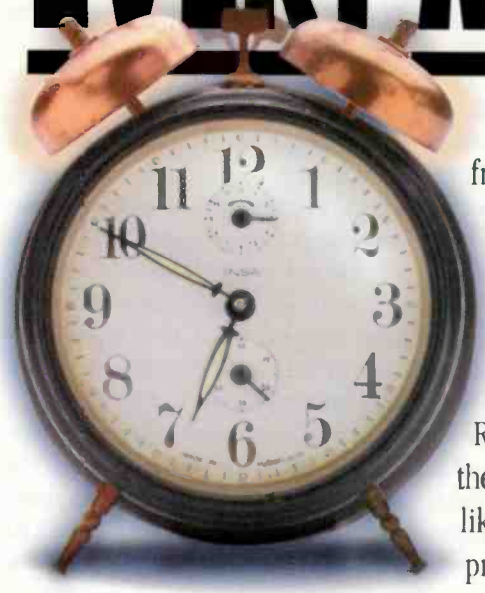

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Engineering as a profit center

By John Caracciolo

Since the Telecommunications Act of 1996, when changes in the rules raised the limits on the number of radio properties broadcasters could own in a market, groups all over the country started staking out dominant market shares. When pricing a station for a potential buyer, a multiple of 20 times cash flow was common. In recent months, the buying frenzy has leveled off and owners must start operating their new facilities. During this period of operation, owners and managers have begun the task of consolidation.

Consolidation is defined as a statutory combination of two or more corporations. It means to bring separate parts together into a single or unified whole. In the process of consolidation, cuts are made to develop a lean, profitable operation. Let's face it, in the consolidated world of radio that we live in, every radio station department needs to be a profit center and contribute to the overall success of the company.

Additional income from tower space rental is a common way to supplement the bottom line.

By many accounts, the millennium's successful radio groups will be judged by how well they adapt to the new profit-center thinking and methods in this competitive, consolidated radio society. The new way of thinking is that every department must produce. Every employee must contribute to the bottom-line success of the company. Typically, sales, promotions and marketing were the moneymakers, while programming and engineering were the liabilities. As a chief engineer turned GM, it was my first priority to turn the old-school image of the pocket-protector chief engineer who always spent money into the profit-center engineering department that found nontraditional revenue under every stone. There are many opportunities for the engineering department to make money for the company.

SCA rentals

These opportunities have always been around, but they are sometimes hard to find. The best place to solicit potential SCA customers is in the world of brokered-time radio. Many brokered-time program hosts would welcome the opportunity for a 24-hour broadcast source. Start by contacting local hosts and shows that buy multiple hours on local stations. Most will need some education and guidance in the world of subcarriers, but the potential for income to the station is worth it.

Another great source for SCA rentals is local high schools and colleges that do not have the luxury of an FM frequency. Most schools that offer communication courses in highly populated areas are shut out when it comes to educational or commercial FM frequencies. An SCA is a wonderful opportunity for schools to have an over-the-air FM signal that is capable of being received on and off campus without the major RF equipment costs that are associated with start-up FMs. This can be a lucrative opportunity for your station. In our case, I had two companies and one school district bidding on our only remaining SCA. I increased our bottom line by more than $100,000 just by making some telephone calls and aggressively marketing our unused SCA channels.

Tower space

With the advent of PCS, cellular, paging and two-way radios, this should be an easy task for any station lucky enough to own its broadcast tower. However, what if your tower is not in a desirable marketable area or you rent tower space? You need to work harder and sell your site. Most PCS and cellular systems require "B" sites or fill sites that could benefit you. Cellular telephone companies desire no dropout and unlimited service for their customers; sometimes a secondary site is valuable to cellular providers. Most cell and PCS antennas are mounted at the 150-foot to 200-foot level of tower structures so the top, expensive real estate of the tower can be left for a paging company or two-way radio user.

If you do not own your own tower, don't worry, you can still make some money with your studio rooftop. If your rooftop is in the 100-foot to 150-foot level, PCS and cellular as well as wireless Internet could be good customers for you.

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To market your tower site or rooftop, try conventional methods like trade publications and industry newsletters; try some unconventional methods as well. Contact the engineers of other area stations and get some contact names and numbers of companies leasing their tower sites. Remember that you are not competition. Most paging and cellular companies require numerous sites in the area to provide service. Another way is to contact the local cellular reseller and get the name of a corporate representative. They can usually steer you in the correct direction.

Vertical real estate comes in many forms. Your own building's rooftop may be a prime spot for prospective tenants.

Dot-com money

Everybody is making money with the Internet. The account executives at the station most likely have many major dot-com advertisers on the airwaves, but there is a way for the engineering department to profit from this craze as well. Most Internet providers, both national and local have *POPs* (point of presence) all over town. They give Internet companies the ability to have local dial-in phone numbers and phone circuits run back to a local location, then electronically tied together and brought back to a central location on one wideband circuit. At WLIR, we have more than six companies renting rack and telephone-room space. Using space that would otherwise go unused is an excellent source of revenue for the engineering department.

Finding the business was easy. Most of the companies were introduced to WLIR through our sales department. They were advertisers first and renters after the fact. The Internet companies love the idea of dealing with an engineering department rather then a real-estate office. We speak their language, we are available to troubleshoot their equipment, and our facilities are always in excellent condition with great HVAC. This unique form of moneymaking net WLIR more than $50,000 last year.

John Caracciolo is vice president and general manager of Jarad Broadcasting Company, Garden City, NY.

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Coaxial cable

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

Coaxial cable is the backbone of RF engineering. Coax has been around so long it's hard to imagine life without it. Fortunately, the days of open two-wire transmission lines are behind us. Today, even experimentally inclined amateurs do not usually mess with open line. Coax is used because of its convenience and general lack of sensitivity to the effects of cable length.

Early coax installations often used available materials, such as plumber's copper piping and tubing. These cables were possibly manufactured by the engineers involved who used at-hand materials.

The characteristic impedance (Z) of a coaxial line is given by the following equation:

$$Z = 138 \log D/d$$

where:

D = the diameter of the outer conductor
d = the diameter of the inner conductor

Coaxial cables are manufactured to exacting specifications and must be properly installed and maintained.

It immediately becomes apparent that the characteristic impedance of a coaxial line is determined by the ratio of the diameters of the two conductors. The greater the ratio, the higher the impedance.

The *propagation rate* or *propagation velocity* of an electrical signal along a coaxial cable is slower than it is in air. This rate is mainly affected by the dielectric, such as foam or spacers. When using coax in applications where wavelength effects (electrical lengths) are important, take the propagation velocity into account. This is especially important when working with directional AM antennas where electrical lengths become part of the operating-system design.

To obtain maximum power transmission from a generator to a load, it is necessary for the impedance of the transmission line between the generator and load to be the same as each device. It is also important that the transmission line has minimum loss. The RF engineer has to consider both I^2R losses and skin effect. If the inner conductor is small in diameter, its ohmic resistance will be high and may cause overheating and power loss.

If the inner conductor is made larger, the impedance will decrease. When this occurs, it is necessary to pass a heavier current through the cable to convey the same power to the load. Unfortunately, although the ohmic resistance of the inner conductor decreases, the power loss due to I^2R losses increases until the latter exceeds the benefits of the former.

Over time, researchers have derived an optimum ratio of inner to outer conductor. This is 3.59:1. The characteristic impedance at this ratio is about 76.5Ω. This is a rather odd value and has been popularized at 75Ω. It is used for video purposes where frequencies are higher and losses usually more significant. Some older TV installations also use 75Ω for RF transmission.

Temperature vs. size

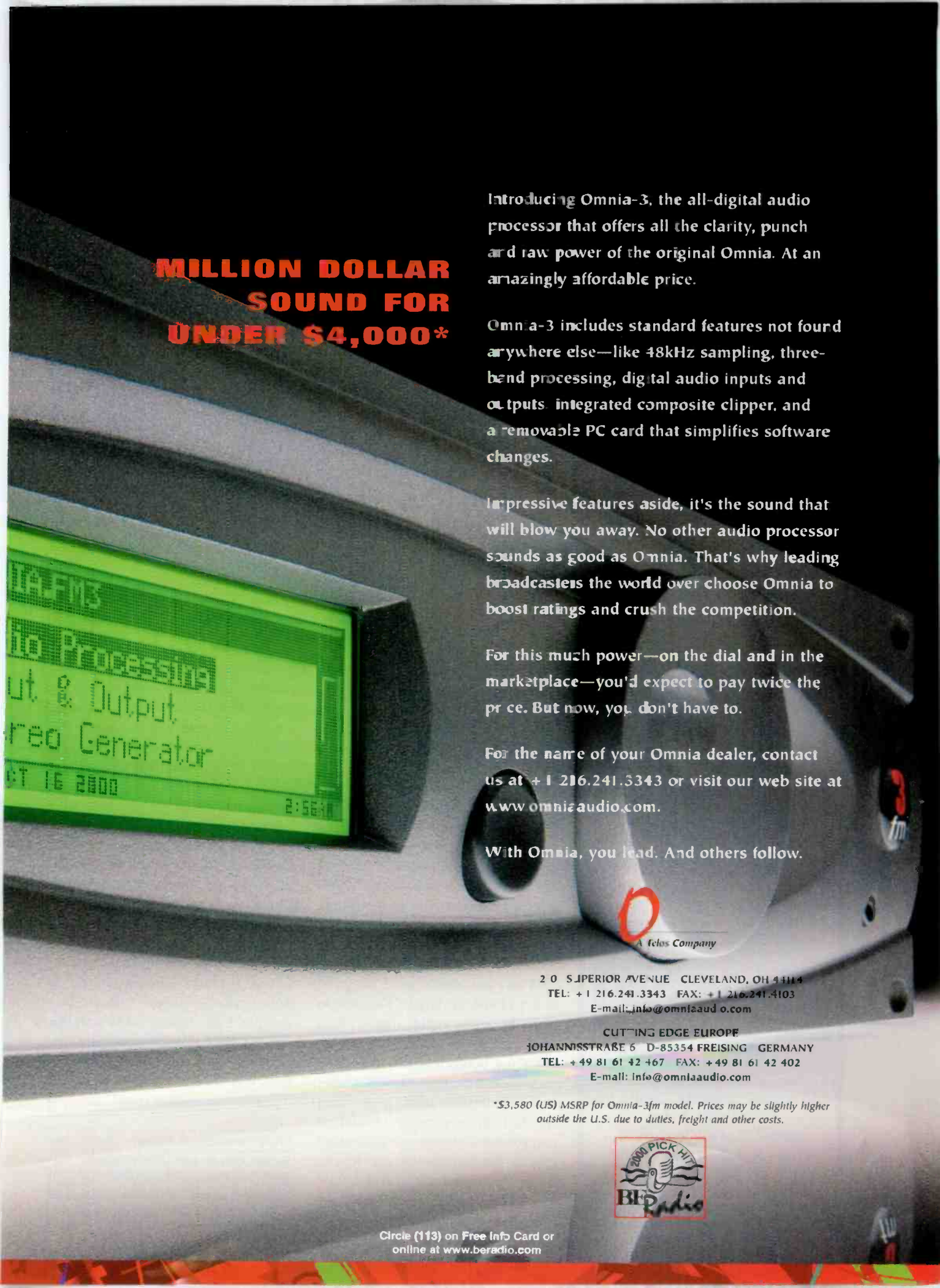
A second factor to consider is the temperature of the inner conductor. This temperature is critical when considering high-power AM and FM transmitters. Excessive temperature rise can cause a number of cable problems.

The average 1kW or 5kW transmitter installation should not suffer from excessive temperature increase in a correctly designed and installed system. Nevertheless, it is important to observe not only the current carrying capacity of a proposed coaxial cable, but also the possible temperature rise due to current and ambient temperature. When operating limits are exceeded in rigid line, it is possible to distort the inner conductor and encounter impedance discontinuities that often lead to breakdown. If overheating occurs in flexible line, it can lead to melting of conductors, impedance changes and discontinuities, and eventually high-voltage flashover and line burning.

It has been calculated that a working ratio (D/d) from the formula above of 1.85 results in the best compromise between small heat rise and low characteristic impedance. At this ratio, cable impedance is about 36Ω. This is too low for practical use in most cases, so the popular value of 50Ω is typically selected for standard use.

Voltage breakdown

Another parameter has to be considered when designing coaxial cable. If the inner conductor is too large (low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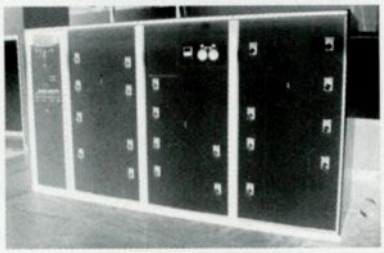

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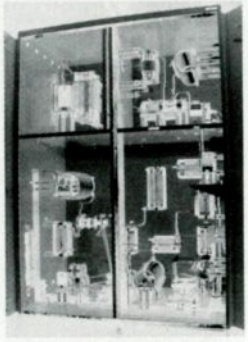

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impedance), the spacing between inner and outer conductors will be small and flashover can occur.

Breakdown caused by voltage gradient limits the amount of power that can be carried. If a conductor is too small, the voltage gradient on the conductor will produce corona or arcing. Again, there is an optimum ratio of inner and outer conductors. Research has shown that a ratio of about 1.65 in the above formula produces maximum power handling characteristics. This computes to around 30Ω, so again, we have compromised at 50Ω.

Coax handling

In radio, flexible, sheathed coax cable is more often used than rigid copper pipe coax. It is delivered on a large reel and, when a proper cable puller is used, there is usually little difficulty in making a secure and efficient installation. As long as care is taken in measuring and estimating, it is possible to order cable, with connectors already attached, that facilitates antenna installation.

In all cases where optimum ratios govern optimum performance, engineers have adopted compromises that quite closely approximate perfection and provide satisfactory performance. These three ratios can be checked by inserting them in place of the expression D/d in the equation above. When designing cable, these three values have to be taken into account.

When rigid coax is used, the availability of specific angled elbows controls the cable bend angles. Thus, there should be no difficulty avoiding acute bends that can affect line-transmission qualities. However, when installing flexible coax, avoid sharp bends that, in extreme conditions, can produce impedance discontinuities at the bend where the spacing between conductors could be decreased. Impedance problems may arise as well as cable failure owing to flashover, air leaks or fractures.

Use dry air or nitrogen to pressurize air-dielectric coax lines. This process is essential if unsheathed lines are used. Dry air, or an inert gas under low pressure, serves two purposes: It decreases the possibility of oxidization or corrosion occurring on the inner conductor or at joints, and the low pressure tends to keep out moisture penetrating through minute leaks.

If a coaxial line has been allowed to run depressurized and moisture ingress is suspected, it is essential to remove all moisture before reenergizing. This involves the use of large amounts of nitrogen to purge the lines. Lines suspected of having corrosion or moisture present should never be energized until the line is known to be safe.

Air dielectric cables should always be pressurized with desiccated air or nitrogen.

Connectors can be a source of reflections or impedance discontinuities if improperly installed or allowed to become corroded. Checking with a *time-domain reflectometer* (TDR) can turn up such problems and give an approximate location of the cause. In AM work, minor impedance discontinuities do not usually have much effect. However, in higher-power FM stations, serious discontinuities can produce effects similar to multipath. Therefore, it is wise to check with a TDR if problems are suspected.

Photos courtesy of Andrew Corporation.

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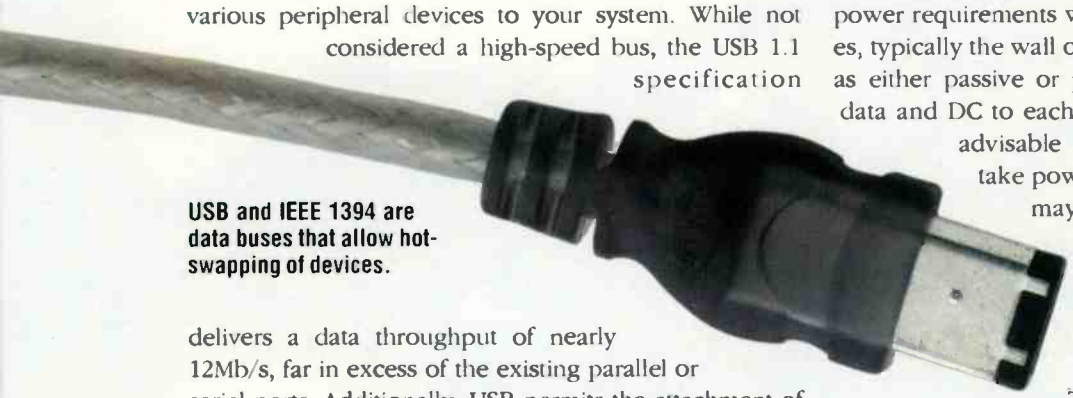
USB and IEEE 1394

By Kevin McNamara, CNE

There is probably nothing worse than spending money on a new PC only to find out that there are not enough ports or interrupts to support all of those cool peripheral devices. However, all is not lost thanks to two options. If you purchased a new PC or Macintosh system in the past two or three years, chances are it is equipped with a Universal Serial Bus or USB port. Originally created by Apple, IEEE 1394, or *FireWire*, has actually been around since 1994 and is beginning to find wide acceptance, particularly among the digital A/V crowd. Both of these high-speed serial interfaces will eventually replace the common serial and parallel ports on your machine. It couldn't happen at a better time.

USB

The USB port provides a simple means to connect various peripheral devices to your system. While not considered a high-speed bus, the USB 1.1 specification delivers a data throughput of nearly 12Mb/s, far in excess of the existing parallel or serial ports. Additionally, USB permits the attachment of several devices without regard for the number of available memory segments or interrupts. In theory, the USB port supports up to 127 devices.



USB and IEEE 1394 are data buses that allow hot-swapping of devices.

Earlier implementations of the USB bus on PCs were disappointing, mainly due to lack of support by Windows 95 and earlier versions of the operating system. A second release of Win95 did permit some limited compatibility with USB devices. The interoperability issues with USB devices was largely fixed in Windows 98 and 2000. For Macintosh systems, USB is only supported by the Mac OS 8.1 or later operating system.

Adding a USB device to a new system is simply a matter of plugging it in and loading the required drivers. Once the drivers have been loaded properly, you can add and remove devices at any time without rebooting. Most new PCs have two USB ports; if more ports are needed, it is a simple matter of purchasing a USB hub. USB uses a tiered-star bus topology, similar to the twisted-pair Ethernet system configuration. In other cases, some USB peripherals have a second port on which you can daisy chain other USB devices. It is important to note that the speed for most PC and Mac USB ports is maxed out at the 12Mb/s throughput; if the system has two USB ports, the bandwidth is shared between each port.

You should also be aware that USB has two operating modes, the high-speed mode of 12Mb/s and a low-speed mode of 1.5Mb/s. The low-speed mode is typically used for devices such as keyboards and mice, which require small amounts of bandwidth. Systems such as the Macintosh G4 provide independent buses, so that each port can operate at full speed.

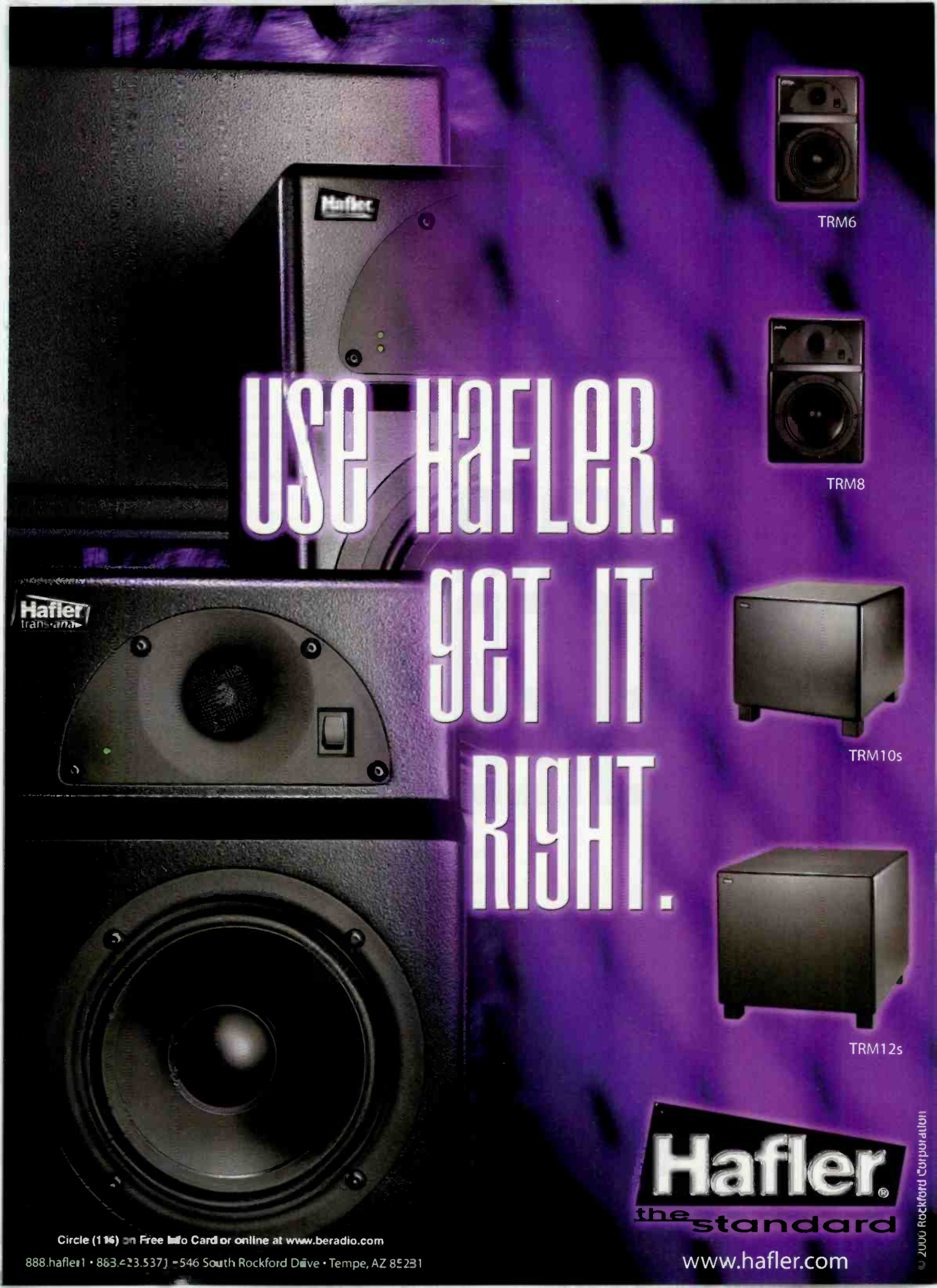
The USB provides data and power over a single cable. In general, devices that have small power needs can be powered from the USB directly. Devices with large power requirements will be powered from other sources, typically the wall outlet. USB hubs can be purchased as either passive or powered. Passive hubs will pass data and DC to each port; however, it is typically not advisable to connect several devices that take power directly from the bus; doing so may exceed the maximum current limits of the source. Powered hubs provide the power to devices attached to it. Cable length should not exceed 5m.

USB uses two types of plugs. Type A plugs are the type found on the back of your machine and are typically used to connect to the host PC or hub. Type B plugs are usually found on the peripheral devices.

A new version of the USB, called USB 2.0, will be appearing soon. USB 2.0 extends the data throughput to 360Mb/s to 480Mb/s while maintaining compatibility with the current USB specification.

IEEE 1394

If your needs include multimedia-intense applications such as digital video import, the IEEE-1394 bus is a true digital interface and presently the superior choice. IEEE-1394 is widely known as FireWire, although Sony has recently begun to market IEEE-1394 devices under the name of *I.Link*. In either case, the bus supports data transfer rates of 100Mb/s, 200Mb/s and 400Mb/s. Future versions of IEEE-1394 will support speeds up to 3.2Gb/s. Unlike USB, IEEE-1394 is based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on a scalable architecture that adapts to the speed requirements of the devices attached to it (up to the 400Mb/s maximum). Up to 63 devices can be attached to an IEEE-1394 bus. Like the USB, devices attached to an IEEE-1394 enabled PC are also hot-swappable and can provide DC power to attached devices.

IEEE-1394 supports two types of data transfer modes. *Asynchronous* transfers are akin to those used with the classic I/O schemes where data requests are made to and received from a specific address. *Isochronous* data transfers use *data channels* that guarantee the data to be transported at a predetermined rate.

USB has two operating modes for full 12Mb/s bandwidth or reduced 1.5Mb/s use.

Another central advantage of IEEE-1394 is that it is a *peer-to-peer* interface, which allows data transfer directly between computer and device, between devices and even between several computers and several devices at the same time. Effectively, IEEE-1394 can create a multimedia network without any special requirements. Cable length for IEEE-1394 cannot exceed 4.5m. Both IEEE-1394 and USB can be added to machines that run the aforementioned operating systems with the addition of plug-in cards.

Nearly every PC sold in the past two years has USB ports included as a standard feature. For this reason, virtually every peripheral product found on store shelves offers some form of USB support. In terms of speed and flexibility, USB ports offer a myriad of advantages over the archaic serial and parallel ports of yesterday. For demanding applications, IEEE-1394 has become the digital A/V transport method of choice. Both systems offer the advantage of being able to share devices across different platforms such as PC and Macintosh.

Photos courtesy of Belkin Components.

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

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

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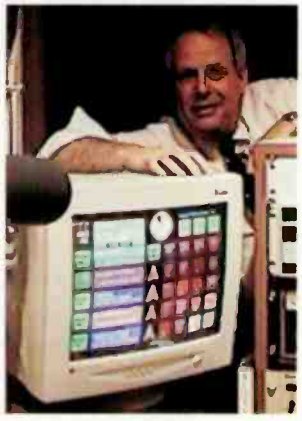

Doug Lane, Owner and GM, WWDL, WICK and WYCK, Wilkes-Barre and Scranton, PA

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

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

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Reporting of tower light outages

By Harry Martin

FAA's Flight Service Stations (FSS) have recently changed the procedures for reporting antenna structure light outages. FSS offices provide a number of pilot services, including *Notices to Airmen* (NOTAM) of flight-related safety information. All owners of towers registered with the FCC that have lighting requirements must do the following: inspect their towers at least once every 24 hours either visually or by an automatic system; maintain an alarm system to provide an indication of any lighting failure, and immediately notify the nearest FSS of lighting failures not corrected within 30 minutes. The FSS then issues a NOTAM.

Once the repairs are complete, the tower owner must again notify the FSS. If the lighting failure or malfunction cannot be corrected within 15 days, the owner must notify the FSS that the outage continues to exist. The FSS will then reissue the NOTAM. If it is not specifically renotified of the outage, the FSS will automatically cancel the NOTAM after 15 days. On February 25, 2000, each FSS began notifying the FCC of reported tower light outages that had not been corrected within 15 days. When a tower owner notifies the FSS of a tower light outage, the FSS will now require that the antenna structure registration number be provided.

Owners should make sure any report of a tower light outage contains all of the required information. Besides providing the antenna structure registration number, the report should state the condition of the light or lights involved, the circumstances that caused the failure, the probable date for restoration of service, the height of the structure (above ground level and above mean sea level), and the name, title, address and telephone number of the person making the report. Failure to follow the required notification procedures could lead to significant liability.

Copyright fees for streaming?

In response to a petition filed by the Recording Industry Association of America (RIAA), the copyright office has initiated a rulemaking proceeding seeking comments on whether streaming radio station programming onto the Internet is exempt from copyright liability under the Copyright Act. Also at issue is whether such transmissions should qualify for the compulsory license or be authorized by the individual copyright owners.

The underlying dispute is whether broadcasters should pay extra for transmitting their programming over the Internet. Broadcasters argue that streaming is covered by the broadcast exemption contained in Section 114 of the Copyright Act. The recording industry wants streaming to be treated as a nonbroadcast, nonexempt service subject to separate copyright fees.

In March, NAB filed a lawsuit against RIAA seeking a declaratory ruling that a simultaneous transmission of an over-the-air broadcast of an FCC-licensed radio station over the Internet is exempt from copyright liability. Subsequently, NAB, ABC, AMFM, Bonneville, CBS, Clear Channel and others filed a motion with the copyright office requesting a suspension of its rulemaking. The copyright office then published a request for comments on the NAB motion. Comments and replies were filed in April.

New RF rules apply September 1

By September 1, all stations must comply with the FCC's 1996 RF safety limits for human exposure to RF radiation. Since October 1997, applicants for new authorizations, including renewals, have had to certify compliance with the new rules. Now, all remaining existing stations must, no later than September 1, 2000, either bring their stations into compliance with the new limits or file a formal Environmental Assessment notifying the FCC of any station's noncompliance. It is the responsibility of each licensee, not tower owners, to undertake an evaluation of RF radiation levels at a tower site and file an Environmental Assessment if required. The FCC will review Environmental Assessments to determine if further action is required to minimize or eliminate the noncompliance. Stations that are in compliance but that have not sought a renewal or other permit or license since October 1997 do not need to file anything by the September 1 compliance deadline.

The new RF radiation exposure rules define two types of environments. Uncontrolled environments are those open to the public. Controlled environments are those restricted to employees doing maintenance or construction. The *maximum permissible exposure* (MPE) limits for uncontrolled environments are typically five times more stringent than those for controlled environments.

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

Dateline

On October 27, 2000 electronic filing will be mandatory for Forms 301 (CP), 302-FM (FM license), 314 (assignment of license), 315 (transfer of control), 316 (pro forma transfer or assignment) and 347 (LPTV and TV translator CP).

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NAB 2000 CHECKMATE

The BE Radio reporters moved methodically through the NAB exhibit floors gathering information. They made all the winning moves to provide this categorical listing of new products at NAB2000.

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Automation systems 34
Computer peripherals 38
Digital audio workstations 40
Audio mixers 44
Microphones & mic accessories 50
RF components, transmitters, towers & antennas 52
Test & measurement 56
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Routing, distribution & intercoms 58
Microwave & telco 59

Audio accessories

By Kevin Nosé

Spanning analog and digital, control and controlled, and everything in between is a task that broadcast engineers will always need to address. A look at the new product offerings from NAB2000 will support this idea in two ways. First, it shows how many manufacturers are addressing the demand for audio accessories. Second, it shows how much is possible when core equipment and technologies are supplemented with accessories capable of filling in the gaps of a studio- or facilitywide design.

Aztec Radiomedia, now part of the **Digigram** group, has integrated a system of various modules into a single stand-alone rackmounted chassis. The NextFM 300 low-power FM station consists of compressed audio file storage, an MP3 audio decoder, a 10W FM transmitter, an RBDS generator and support for playlist automation. The intended application of the NextFM

300 is for automated radio programming, roadside traffic and tourist information, and as a component in public-address systems for shopping centers, amusement parks or transportation terminals. Control and configuration are accomplished using TCP/IP.

Broadcast Tools unveiled the DC-10 dial-up remote control, which combines an auto-answer telephone coupler with touchtone decoding to control up to 10 relay-closure functions. Eight analog control inputs are also supported and it can conditionally call up to six numbers. The SRC-1616L serial remote control provides 16 control inputs and outputs for use with any device with a serial port. The unit offers an ideal interface between studio consoles and automated hard-disk storage systems. The MSO-8 control panel is a rack enclosure with a finished front panel which can house and control any of the company's tiny form-factor products. Taking the DC-10's functionality to the next level, the MC-16 telephone hybrid/coupler (see Pick Hits, page 60) is able to send serial command strings based on decoded touchtone signaling. The DSC-32/64 satellite channel controller can be programmed to display the receivers it is connected to on a text LCD; the unit can also query time information from Starguide equipment and generate contact closure events based on that information.

Circuitwerkes showed the CP1/2 call progress decoder, which recognizes a dial tone or other audio signals to disconnect a call when normal end-of-call battery signaling is not provided. It is available as a stand-alone product or as an expansion option to other Circuitwerkes telco products. The silencer II completely removes DTMF tones from a real-time audio signal, allowing control cue channels to be used as control-free program material. The SEN-6 encodes 25Hz, 35Hz and mixed 25+35Hz subaudible tones onto a mono audio signal. Also supports 50Hz and 75Hz tones.

Hafler Professional showed the M5 speaker. This near-field, passive, two-way monitor provides the qualities of the TRM6 in a compact, nonamplified version. It will work with the TRM10s active subwoofer.

Henry Engineering introduced the DigiStor II multimessage digital audio recorder/playback unit, which provides speech-quality storage for news or telco applications. Up to 16min of mono audio can be stored in nonvolatile, solid-state memory with 6.5kHz bandwidth and 60dB of dynamic range.

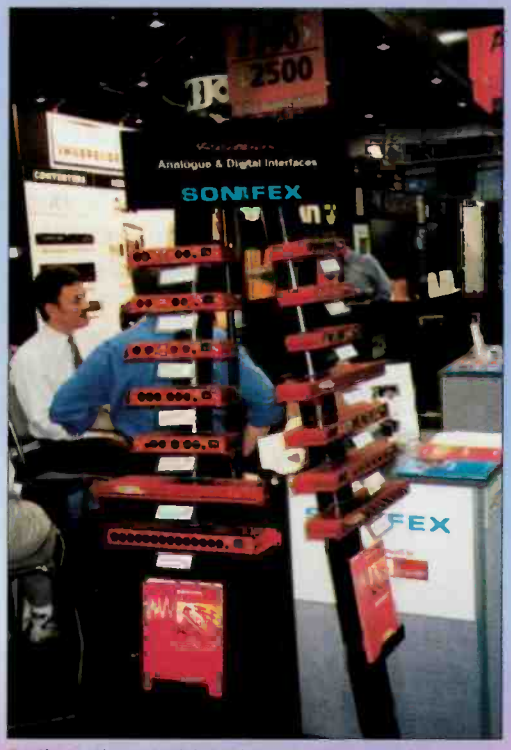
Of note at **RDL (Radio Design Labs)** are the new Flat-Pak line of products that can easily be rackmounted as well as those digital audio products that make use of the Sure-Lok auto-recovery circuitry to prevent latch-up and maintain digital signal lock. The new digital audio product collection includes AES-3 and S/PDIF converters, 1×4 distribution amplifiers, 4×1 selectors, and digital-to-analog converters. They are all capable of supporting sample rates up to 96kHz and word resolutions up to 24 bits. Also of note is the RM-MP12 Audio Monitor Panel, a 1RU device that accepts up to 12 mono input audio signals. Front-panel switches select one of the 12 inputs to monitor with a VU meter and speaker powered by a 4.5W RMS power amplifier.

The IT line of studio products from **SBS** is now available in the U.S. through **Broadcasters General Store**. Match-IT, DA-IT, MicLim-IT, DA-IT, Mic-IT and Line-IT perform common studio tasks, are small enough to hide, and have a fully enclosed chassis and integral power supplies.

Sonifex, distributed in the U.S. by **Independent Audio**, showed its set of analog and digital connections boxes. Its Redbox series includes dedicated mic pre-amps, limiters, unbalanced-to-balanced interface boxes, headphone and distribution amps. Digital products in the series include six-way distribution amps (choice of AES-3 or S/PDIF), 24-bit/96kHz sample-rate converters, and combined A/D and D/A converters.

TGI North America, distributor of **Tannoy**, showed the new PS350 subwoofer, which employs pro Bash technology to power a 15-inch driver using a 350W amplifier with both high efficiency and low distortion. The PS350 has left-, center- and right-channel XLR inputs with corresponding HPF crossover outputs. It has a low-frequency effects XLR input with selectable 120Hz low-pass crossover and support for remote bypass control.

Ward-Beck had a number of new AES-3 support products this year: the D8205, D8206, D8207 and D8208. All of these cards operate within an MF82-type frame and can be ordered with either 75Ω unbalanced or 110Ω balanced I/O support. Each card can also function as an AES distribution amplifier with as many as eight outputs. The D8205 performs adjustable gain, mixing and sample-rate conversion on two inputs. The D8206 generates reference signals. The D8207 performs sample-rate conversion on one signal, and the D8208 performs level adjustment. The XTM4 analog and AES level meter makes use of a stereo VU and PPM moving needle meter pair to monitor analog, AES-3 and AES-3ID input signal levels. A bar-graph LED phase indicator is also supported. Also new for Ward-Beck are additions to the POD line of products: the POD17, an adjustable-level AES distribution amplifier with sample-rate conversion, the POD18, a quad analog audio level matcher, and the POD19, a serial digital demuxer.



Audio and control interfaces and converters were displayed at several booths.

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Kevin Nosé is president and director of engineering of NeoSonic Industries, Cleveland.

CHECKMATE

Audio recording, storage & playback

By Steve Fluker

The demand for high-quality audio recording continues to increase not only in the studio but also in the field. Manufacturers are meeting the needs of customers with new, innovative ways to capture sound.

Digigram introduced the RCX handheld recorder with an optional built-in microphone. This tapeless, high-quality recorder offers a variety of soundcard modules, which are available for single or multichannel options with support for MPEG Layer II and G.722 formats. A USB connection allows direct transfer of audio files to and from a computer, where the included editing software allows the cleanup of the cuts. **Nagra** offers an identical unit, called the ARES-P, that does not include the USB port.

ENCO introduced the Digital Intern Phone Editor, a software package designed to work on a stand-alone, Win2000 computer with many features for quick, on-the-fly editing. It includes an array of hot keys.

Media Touch introduced iMediaLogger, a logger, skimmer and network recorder. It allows real-time audio recording of up to four simultaneous mono or stereo source feeds and live Internet streaming of recorded audio with full HTML system management. It operates in either incremental logger mode or scheduled source feed record mode and supports a variety of audio formats, including MPEG II, MP3, WMA and ACELP.net.

Maycom introduced a handheld stereo recorder with an internal speaker.

360 Systems brought its version of a multitrack recorder to the show. Primarily developed for video use, the recorder can also be used for field concert recording. Nine to 50 G drives can give the user up to 12 hours of eight-track recording time. A built-in editor allows edits across all eight tracks or on each individual track. A built-in DVD RAM drive gives up to 10 track-hours of 24-bit audio on one disc.

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Steve Fluker is the director of engineering for Cox Radio Orlando.

Audio processing

By Benjamin Brinitzer, CSRE, MCP

NAB2000 was filled with advances in processing technology. Advances continue in the area of equipment consolidation. Some of the products offered this year are separate packages, such as stereo enhancement of the FM composite signal. Others products are streamlined, feature-packed versions of full-line products that target those with limited financial resources.

In the first year after it was purchased by **CRL (Circuit Research Labs)**, **Orban** has made a splash with the release of the Optimod-FM 8400, which includes a completely redesigned front panel with a color, flat-panel interface. The inside of the unit is based on new DSP technology that uses intelligent peak limiting, built-in composite stereo enhancement based on two of Orban's heritage stereo enhancement products, and built-in parametric equalization. It has three levels of control (versus the two levels provided in the 8200). Also introduced was a 1RU version of the Optimod 6200 (called the 6200S).

Cutting Edge debuted a complete line of new, less-expensive processors in the Omnia line. The Omnia-3 (see Pick Hits, page 60) is a scaled-back version of the original Omnia series targeted toward the markets that want quality processing without the price. The new line has three versions: FM, AM and Net. Also unveiled was the Omnia-6, targeted toward the high-end market. The Omnia 6 currently comes in two versions: TV and FM. The Omnia 6 uses increased DSP power and features 96kHz processing with a 24-bit dynamic range. The Audio Tool-Vox mic processor, introduced last year, is now shipping.

Aphex Systems showed its line of processing products, including the FM 2020, Compellor 300 series and 100 series of processors. The latest addition includes the tube-based 1100 mic preamp, unveiled last fall.

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Benjamin Brinitzer is regional director of engineering, AMFM, Raleigh, NC.

Satellite equipment & services

By Jerry Mathis

Satellite communications systems continue to come of age, and the latest and best were presented at this year's NAB convention. The satellite products you are looking for are now available, and at reasonable prices.

NPR Satellite Services offers C- and Ku-band satellite services for audio and data systems. The company also provides distribution and private network services.

NSN Network Services promoted its new satellite service, called Supercarrier. This service is being used by some of the larger, prominent networks for programming, including Rush Limbaugh, Dr. Laura Schlessinger, the Cincinnati Reds and Art Bell. Along with digital stereo audio, Supercarrier also offers high-speed IP/Data or Ethernet, including store and forward. A relay expansion card is also available for expanded cueing or control purposes. NSN also has improved its webcasting services.

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Jerry Mathis is network engineer at LifeTalk Radio, Vonore, TN.

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Automation systems

By Steve Fluker

The past two decades have seen many changes in automation systems, from the old cart carousels, to CD jukeboxes, to digital computer automation. The push now is to make the new delivery systems work on most available sound cards, from professional cards to budget cards, which makes it economical for program directors and sales managers to listen to cuts at their desks. Many manufactures are also moving toward standardizing the files by going to the Cart Chunk format. This move toward standardization makes everyone a winner, from the manufacturers to the end user.

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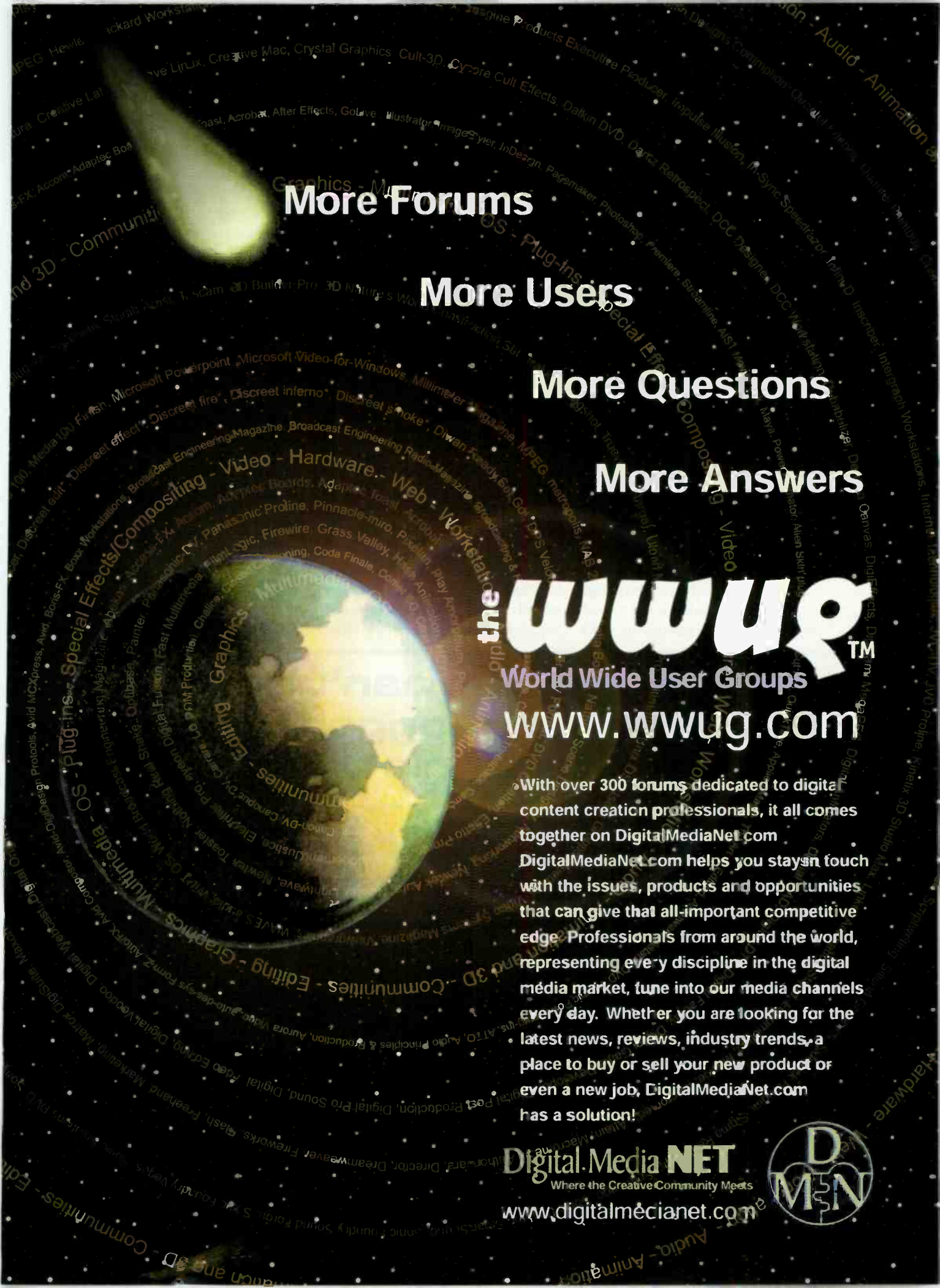
Broadcast Electronics is moving away from proprietary hardware and has streamlined its products. One such product is the AV Express, which targets the small markets while offering full packages for the larger groups. The system operates on a variety of Digigram cards or uses any Windows soundcard driver. AudioVault can now play up to three streams simultaneously on one audio card, an improvement over the previous one-stream-per-card output. It can even store audio on less expensive ultra IDE drives running at 7200 RPM. The company has adopted the Cart Chunk format but will be backward compatible to support files in older AV100 systems.

MediaTouch has updated software, providing a more robust and bullet-proof automation. It works on any Windows sound card or driver supporting linear, MPEG II or MP3 files with multiple overlapping of audio streams on each audio card. The software now has a search feature to look for key words, great for music theme hours and programs. The satellite automation also has the stretch/shrink feature to make the stop sets exact in length. Supported automation include news/talk, satellite and voice-track automations.

Prophet Systems introduced the NexGen Digital storage and automation system. This release has multiple layers of redundancy, including multiple databases mirrored on the servers. Audio cuts are now also stored in the workstations in the control rooms, which not only gives increased back-up, but also reduces the amount of audio carried live over the network. New features in the recorder/player include support for the Cart Chunk WAVE format, ability to record in a linear mode, and a CD ripper.

Cartworks now runs on Windows 2000. New to the package is an audio browser, which allows any workstation connected on the LAN to listen to and view the information about any audio file. CD Trax, a ripper program, is also included. Top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it off with a DTMF remote-control option, which can be used to pause the system, switch audio sources on and off and restart the automation. Excellent for remote broadcasts.

Broadcast Software International has introduced WaveStation 3.0 software, a low-cost automation package with many of the features of more expensive systems. The software will work with standard or professional audio cards, talk with most traffic and music scheduling programs, and support ADPCM, MPEG and MP3 audio formats. Also available are satellite automation and voice tracking. Audio files, programming instructions and logs can be sent to the system via regular Internet e-mail. For production work, the system comes standard with the Cool Edit software.

Computer Concepts has added to its Maestro 3.0 software. New WAN capabilities will label and transfer logs and other files, including audio to local workstations or to stations in other cities, all in the background. A CD ripper has also been added. Maestro has extended its automation features to include making choices about adding or cutting songs, based on rules set up and entered by the program director. It even automatically corrects time lengths of satellite-automation stop sets to make them the exact length.

ENCO will now convert an existing library to the Cart Chunk format. The company also has integrated the CD Ripper into its software and supports MP3 files. The new Scheduling Wizard was introduced, which is a traffic interface creating a clock-type screen graphic. ENCO's new Gateway LAN/WAN will now allow transferring files from one location to another over any mode from 28.8 to ISDN modems to T1 lines.

Scott Studios brought new hardware to the show this year to improve redundancy, including a small, rack-mount RAID package. One of the more innovative items in its software is a new automation system to report school closings. Local authorities have access to call in last-minute school closing information that is immediately available on Internet webpages, for dial-up information lines or even for voice reports available for on-air broadcasts during automated and unattended operation times. The software contains a high-level security access to prevent unauthorized calls.

Arrakis introduced the DL4 software to add automation or satellite automation to its Instant 3-Play box.

RCS continues to push for a data-storage standard that is based on the XML standard. The new product being shown was RadioShow, which is designed for webcasting use. The product will display additional information relating to the audio being streamed and offer e-commerce options.

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Steve Fluker is the director of engineering for Cox Radio Orlando.

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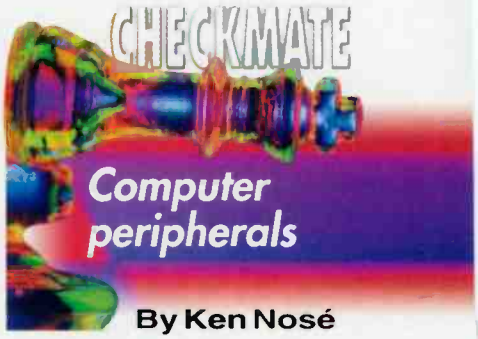

By Ken Nosé

Most of the new offerings in computer peripherals at NAB showed that, as in the computer industry in general, there is always a market for squeezing more horsepower and more features into existing products. Most of the new products were enhancements to existing product lines, differentiated only by new features and improvements in the price-to-performance ratio. However, the end result for the consumer is that it is getting easier and cheaper to push more and more of your radio station into the computer.

Antex showed two new audio adapter cards, the BX-12 Broadcaster and the LX-24M. The BX-12 Broadcaster is designed for simultaneous production and on-air playback, featuring two separate production and playback subsystems with independent sample clocks and support for digital mixing within each subsystem, and MPEG

Layer I and Layer II support. The LX-24M is a half-sized PCI card that supports two analog inputs and four output channels, with support for simultaneously mixing three virtual devices to any output. The card also has support for MPEG Layer I and Layer II. Both cards have driver support for Windows 95/98/NT/2K.

AudioScience showed two new cards for broadcast applications. The

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ASI4125 card features the ability to play back and record MPEG Layer II streams with independent sample-rate and compression formats on four stereo outputs and one stereo input simultaneously. The input pair and four output pairs can be balanced analog or switch-

IBOC demonstrations showed that DAB in the US is not far off.

selectable between AES-3 and S/PDIF digital. The four output streams can also be routed and mixed to an additional balanced analog output pair.

The ASI4336 sound card features an RS-422 serial input for direct MPEG recording from a satellite receiver as well as GPIO section consisting of 16 opto-isolated digital inputs and eight relay isolated digital outputs for equipment control and feedback. Features include support for mixing four stereo streams of playback and three balanced analog stereo inputs down to four analog balanced stereo outputs. Drivers support DOS, Windows 98/NT/2000 and LINUX.

Digigram showed a number of additions to its family of Type II PC Card sound cards for laptops. The VXpocket 440 features four balanced analog channels that can be configured as either all inputs or outputs, or two inputs and two outputs. It also features one stereo S/PDIF digital input and output and a time-code input. The VXpocket v2 replaces the existing VXpocket and offers the same basic features as the 440 in a two-channel version. The PCXpocket 440 is a new entry in Digigram's PCX family of Type II PC cards. It features four input channels and four output channels, two of which can be configured for S/PDIF digital I/O. The PCXpocket 440 has DSP resources for MPEG Layer I, Layer II and GSM encoding and decoding as well as a number of real-time effects, such as cross fading, time-stretching, format and frequency conversions. The PCXPocket family is compatible with Windows 95/98 and NT 4.0. Also new from Digigram is a software-only multichannel encoder for 5.1, which runs as a plug-in to its Xtrack software or as a stand-alone application.

MediaFORM, maker of manual and automated CD duplicators, showed its new SmartDrive2 CD-R drive. SmartDrive2 is a 12×/8× CD-R duplication drive that features new copy protection and watermarking features for intellectual property protection. New watermarking features can imprint the date, time and specific drive burning the CD onto every disk made with the drive. The copy protection features allow you to limit the number of copies that can be made of a CD and the specific brands or types of media that the CD can be copied to when copies are made on another SmartDrive2 drive.

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Ken Nosé is chief software architect, NeoSonic Industries, Cleveland.

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Digital audio workstations

By Conrad Trautmann, CSRE

Digital audio editors were everywhere at the NAB2000 show, all with different types of features and price ranges. Twenty-four-bit processing also seems to be the standard to which everyone is upgrading. If you are looking for a digital audio editor for your studio, the choices are numerous, and the features available are more numerous still. Systems are available for you to supply your own hardware or order a complete package.

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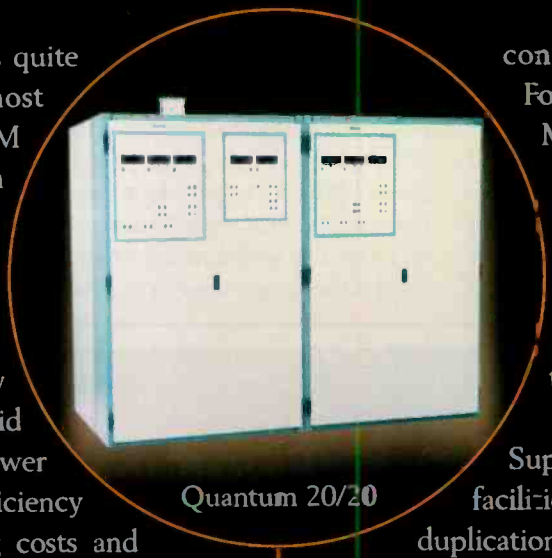
The dual configuration Quantum 20/20 with up to 44,000 watt capability now offers a practical solid state solution for high power FM stations. Overall efficiency of 68% keeps operating costs and cooling requirements at a minimum.

The Quantum transmitter's built-in redundancy and duplication features contribute to exceptionally high on-air confidence. Broadband RF Power Modules and IPA Modules each have their own Switching Power Supply Module. Both amplifiers and power supplies can be removed and serviced while the transmitter remains on air.



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Orban has added SCSI CD-ROM support to the Audicy version 3. Also added is support for five new types of digital effects, including digital delay, chorus and flanging effects, and a vocal eliminator for stereo productions.

TC Works debuted the SPARK XL digital workstation. It supports Pro-Tools formatted files and its big selling point is its audio-restoration features. It includes de-noising and de-clicking.

At the show this year was **Sadie's** new product, the Edit Slate. Editing is done not with a mouse, but right on the monitor with a cordless pen on a flat-panel display (1024×768). Wave the pen over the display and the on-screen cursor will follow; touch the pen to the screen for a left click. It also offers character mapping, allowing you to draw a "U" on the screen for undo, a "Z" for cut, and a backward "Z" for paste. It is a different approach, but one you could get used to in a matter of minutes and may never want to give up.

Netia, the automation system manufacturer, also offers a digital audio editor. While most digital audio delivery companies sell editors inclusive with their suite of programs, Netia can break out just what you want. The Netia workstation offers 15 tracks of audio with features like time-squeezing and stretching. The editor can be stand-alone or tied into a Windows NT network if you want to share files among studios.

Several DAW manufacturers offered new products for video applications, such as **Pro-Tools** and **AMS/NEVE**. Others added Internet-related functions to their products, like **Sonic Foundry** and **Sonic Solutions'** iMaster.

Digital editors have become a vital element in most radio stations.

Tascam had a few new products this year, including a digital audio workstation controller. It uses the USB port to interface to a PC and includes a full midi interface.

Soundscape Digital Technology introduced R.Ed, a hardware/software recorder editor. The 32 track, 24-bit hardware has up to 28 inputs and 32 outputs per unit and supports up to 96kHz sample rates. It runs on Windows 98 or NT. Another new line of products from Soundscape is its ibox audio interfaces. These include analog to TDIF interfaces in two- and eight-channel versions, ADAT to TDIF interfaces and more.

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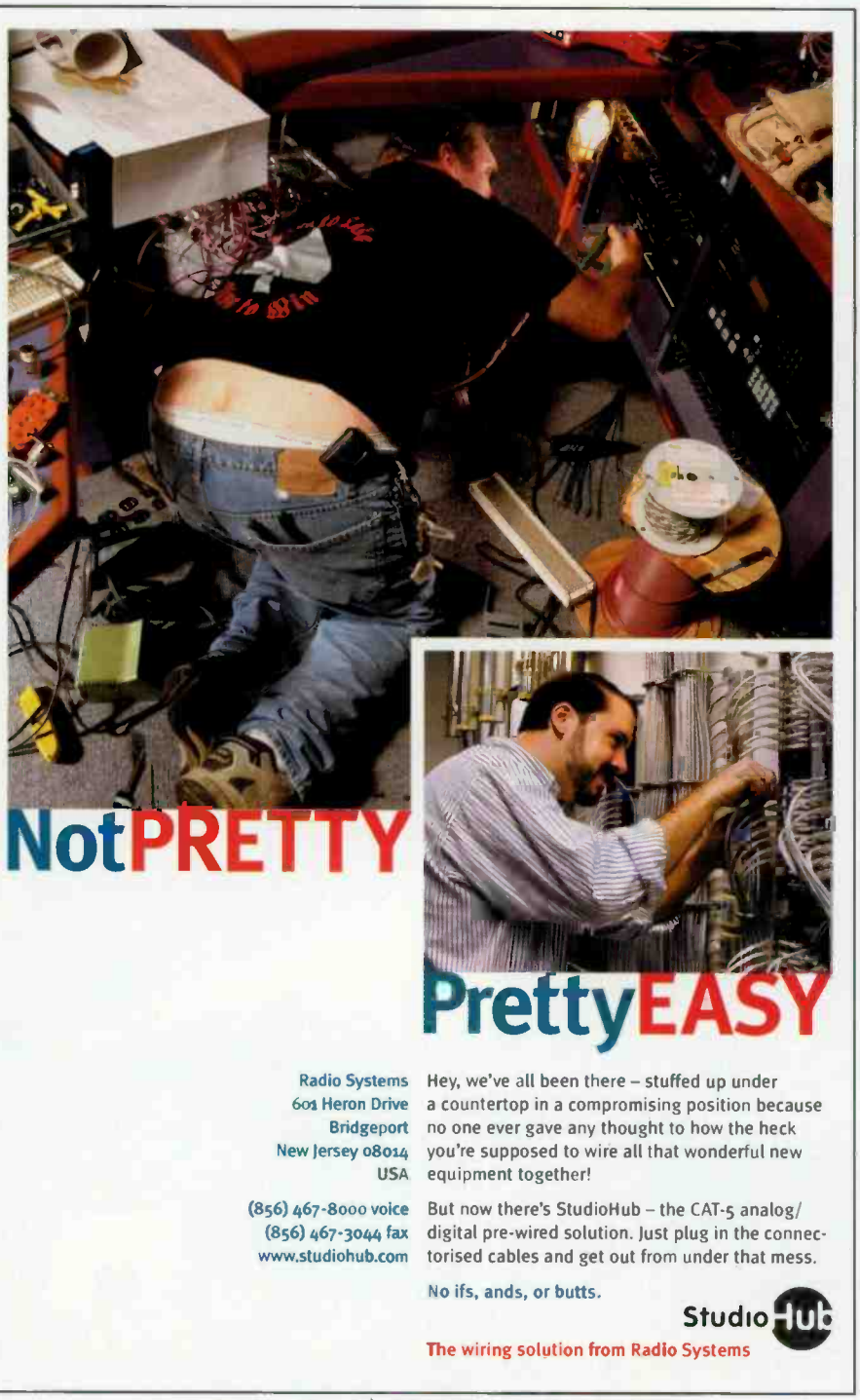
Conrad Trautman is chief engineer and IS manager for Cox Radio, Long Island, NY.



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CHECKMATE

Audio mixers

By Kent Kramer, CBT

Audio mixers, whether small ones for remote broadcast and field production or large studio mixing boards with audio routers built in, had one thing in common at NAB2000: They packed more features into less space. With the help of DSP and other digital innovations, the manufacturers have made the equipment more versatile and compact.

AETA Audio showed the Mix 2000, a four-channel, portable stereo mixer. Each input has a switchable high-pass filter and phase reversal switch. A 16-segment LED bar-graph meter provides level monitoring with a selector switch for independent mix monitoring as well as a listening-mode selection switch and a master output with a selectable compressor and limiter. It also provides a headphone output with level control.

Ward-Beck Systems showed its recently introduced R2K line of 12-, 20- and 28-channel radio production consoles as well as several pieces of audio metering, monitoring and distribution equipment.

Equipment demonstrations gave attendees a chance to look inside some of the equipment that was on display.

Harris showed its full line of consoles. The modular Airwave digital console is the newest digital console from Harris Pacific. Built on the analog version of the Airwave, the Airwave digital offers three stereo program buses. Each has digital and analog outputs, two frame sizes (12- and 20-input), two telephone mix-minuses, sample-rate conversion on all-digital inputs and field-convertible modules from digital to analog and back. New to the Harris Pacific console line is the new Super Mix-minus module for the X-Class analog consoles. The Super Mix-minus module adds eight mix-minus outputs while on- or offline. An installation harness is part of the installation kit.

RadioMax showed the **MixMax**, a six-stereo input, one stereo output audio mixer with an onboard CPU that controls all mixer parameters. All functions are controlled by an RS-232 link and status is reported

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through eight TTL output closures.

JK Audio sported its new Remote Mix Sport Phone Line/Handset. The Remote Mix Sport adds to the capabilities of the Remote Mix 3 by providing three XLR mic inputs and three headphone outputs.

Colorado Digital by **Arrakis Systems** introduced the Revolution digital console, shipping in 12- and 18-channel modular frames. Analog and digital inputs can be mixed and matched within the console. The rackmounted audio engine provides inputs and outputs on Molex and XLR connectors with connection to the control surface via an RS-232 link. The REV-12C and REV-18C are traditional consoles in appearance and can operate with or without a PC. The REV-12P is a 12-channel, 24-input virtual console using an LCD touchscreen capable of having 12 faders at a time on the screen with full metering and control. Integration with Arrakis routing switchers can increase the input capability of the console.

Wheatstone, Audioarts and Auditronics showed several new consoles.

Klotz Digital displayed its new 16-fader Paradigm digital audio console for radio. The Paradigm includes three-band EQ, voice processing, sample-rate conversion on all digital inputs, assignable machine control I/Os to any input. The newly designed modular mixing console, Vadis D.C. II, is also available for the Vadis router system. The open architecture of the Vadis surface allows any requested surface to be built, including a split-console system. Klotz also showcased its Vadis 880 and Spherion digital mixing consoles.

Logitek introduced a number of new products for its digital audio console line, including an Optical Network card for interconnecting multiple audio engines, the IO8D Digital I/O card, which increases the current 20-bit sampling rate to 24-bit at 96kHz with eight digital inputs and eight digital outputs. the IO8D card allows up to 32 engines to be connected providing an audio matrix up to 512×512. The new VmixNet software allows TCP/IP connections between the office LAN/WAN and the digital audio engine. Another benefit of the VmixNet software it that it allows a virtual fader to be placed on a desktop anywhere on the LAN/WAN to control an output of the system for use outside of the studio area. The VmixNet software also allows

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for modem control of an audio engine for remote broadcasts. Also shown was the AESuper software, which provides centralized control of multiconsole facilities.

Wheatstone Corporation debuted several new items across its product lines, including **Audioarts** and **Auditronics**. The Wheatstone D-700 digital radio console expands on the already powerful D-600 console. The ability to store and recall up to 99 user presets allows for entire console configurations to be recalled. Like all Wheatstone consoles, the D-700 is fully modular. To aid in the setup of the D-700 and the D-600, Wheatstone introduced its VDIP software interface protocol to allow the console to be programmed with a PC. Settings can be loaded via a serial interface, where they are stored in nonvolatile storage. VDIP also works with the new Audioarts D-70 and the Auditronics 220 consoles. Also new to the Wheatstone line is the D-5000 digital console. The D-5000 provides a traditional-style console with many of the same features as the popular A-5000 console but with the power of DSP. The newest addition to the Audioarts product line is the D-70 digital console. A/B switching on the input modules, sample-rate conversion on the digital inputs, analog and digital outputs on all four stereo buses, dual caller phone module with DSP generated mix-minus and a console clock with ESE time-code input are all standard. Auditronics debuted the new 220 series console, a modular console featuring a tabletop design capable of any combination of microphone and line-level inputs. A serial interface allows connection to an automation system. Also offered was a new version of the NuStar digital console, NuStar version 4.0. The major addition to the NuStar is the routing switcher concept to the console on a module by module basis.

BNet Radio webcast live from the show floor during the convention.

Studer offered software upgrades to its production and on-air digital audio consoles as well as an upgraded control surface to the D950.

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Kent Kramer is engineering manager for KLYY-FM, Los Angeles.

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CHECKMATE

Microphones & mic accessories

By Brian Sanders

The popularity of large-diaphragm condenser microphones continued at NAB2000, with product introductions at both ends of the price spectrum.

Many exhibitors provided side-by-side demonstrations of their new and existing products.

DPA (Danish Pro Audio) introduced its model 4041 large-diaphragm system. The kit ships with two pre-amp bodies, giving the engineer a choice of tube or solid-state characteristics.

Audio-Technica's latest addition to its line is the AT4047/SV. The mid-priced condenser includes high-pass filter, 10dB pad and furnished shock mount and case.

Soundelux unveiled the R-1, a large-diaphragm condenser with a 1-inch diaphragm and transformerless FET output.

Although **Neumann's** new KMS-105 is primarily aimed at the performance market. Its hypercardoid pattern and four-stage internal acoustic wind filter recommend it for announcer/voiceover applications, too.

Sennheiser announced its MKH800 with a stated frequency response to 50kHz. Its next-generation design shares many of the features of the earlier MKH80: five-position pattern control, pad and two-stage bass attenuation and treble (10kHz) emphasis.

In contrast to **AKG's** recent development of large studio mics (C3000 cardioid, C4000 multipattern and Solidtube), the company's new product at NAB was a subminiature (l: 14mm, d: 5.5mm) lavalier. The CK 77 WR is a water-resistant version of its dual-diaphragm omni offering flat response and reduced susceptibility to cable and handling noise.

JFA imprints call letters and artwork on windscreens. The German company has developed a new process that reduces fading and flaking of on-foam printing.

Aphex brought its Model 1100 discrete class A Tube mic pre-amp to the show. It is a two-channel design with a 96kHz 24-bit A/D built in.

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

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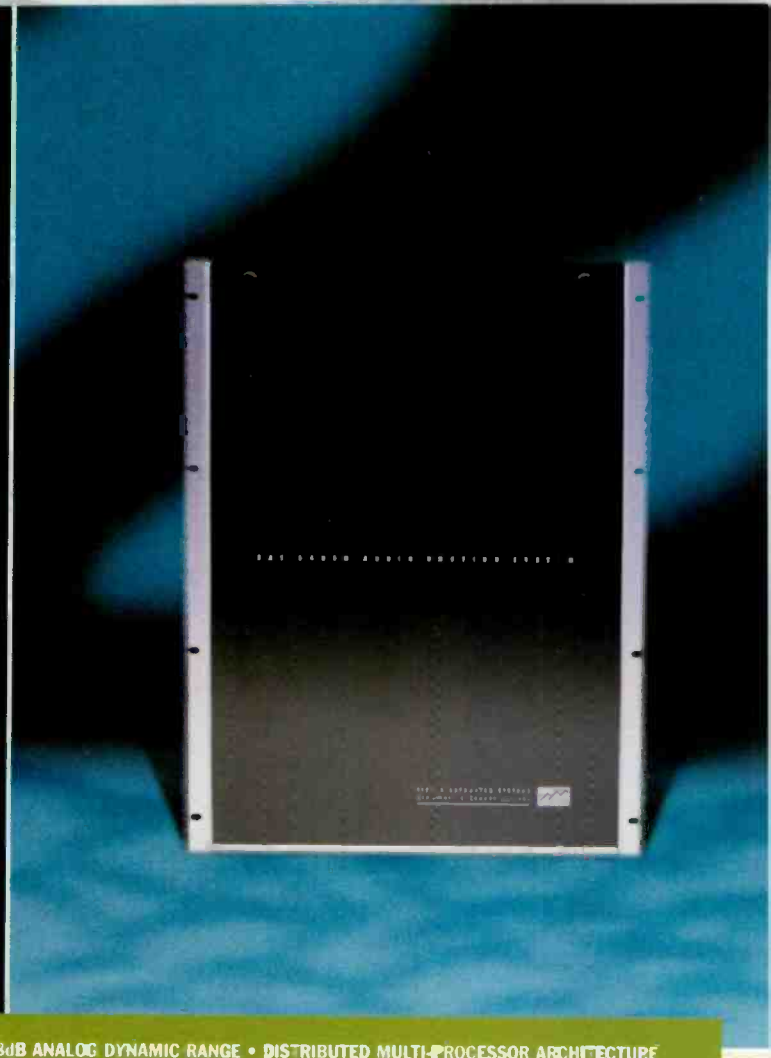

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BROADCAST & COMMUNICATIONS

RF components, transmitters, towers & antennas

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

With an eye toward an IBOC future, several transmitter manufacturers showed transmitters for use with IBOC and in some cases had demonstrators in use on the floor. Translators have become a little deflated as the LPFM debacle makes the future of FM even more precarious.

Armstrong Transmitter showed the X-500 AM and X-1 AM solid-state AM transmitters designed especially for use with IBOC DAB.

Crown offered a 10W, completely portable FM transmitter that accepts both analog or digital inputs and operates on a 15V supply. The unit includes exciter, stereo generator and power supply. A 100W model is also available.

Dielectric announced several price reductions on its antennas while maintaining its first-class performance. The company also demonstrated a new, elliptical-function FM filter for IBOC based on its DTV technology and a new, reduced-downward radiation FM antenna for high-RF sites that cannot support the wind load of a ½-wave spaced antenna.

Antennas towered over the show floor.

Silicon Valley Amplifiers introduced the 10-1000, a 1kW amplifier requiring only 10W of input drive. The broadband unit requires no tuning. Also shown was a self-contained 50W to 100W exciter/LPFM transmitter.

Shively displayed the digital/analog combiner for use with IBOC transmissions.

Broadcast Electronics has added a 2.5kW and a 5kW solid-state stereo AM transmitter to its line. These transmitters use Class E modulation.

QEI showed the Quantum M-series transmitters which cover a range of 1.2kW to 5.4kW. in a cabinet less than 5 feet high.

OMB had the 25,000 EM transmitter on display. This is an economy-

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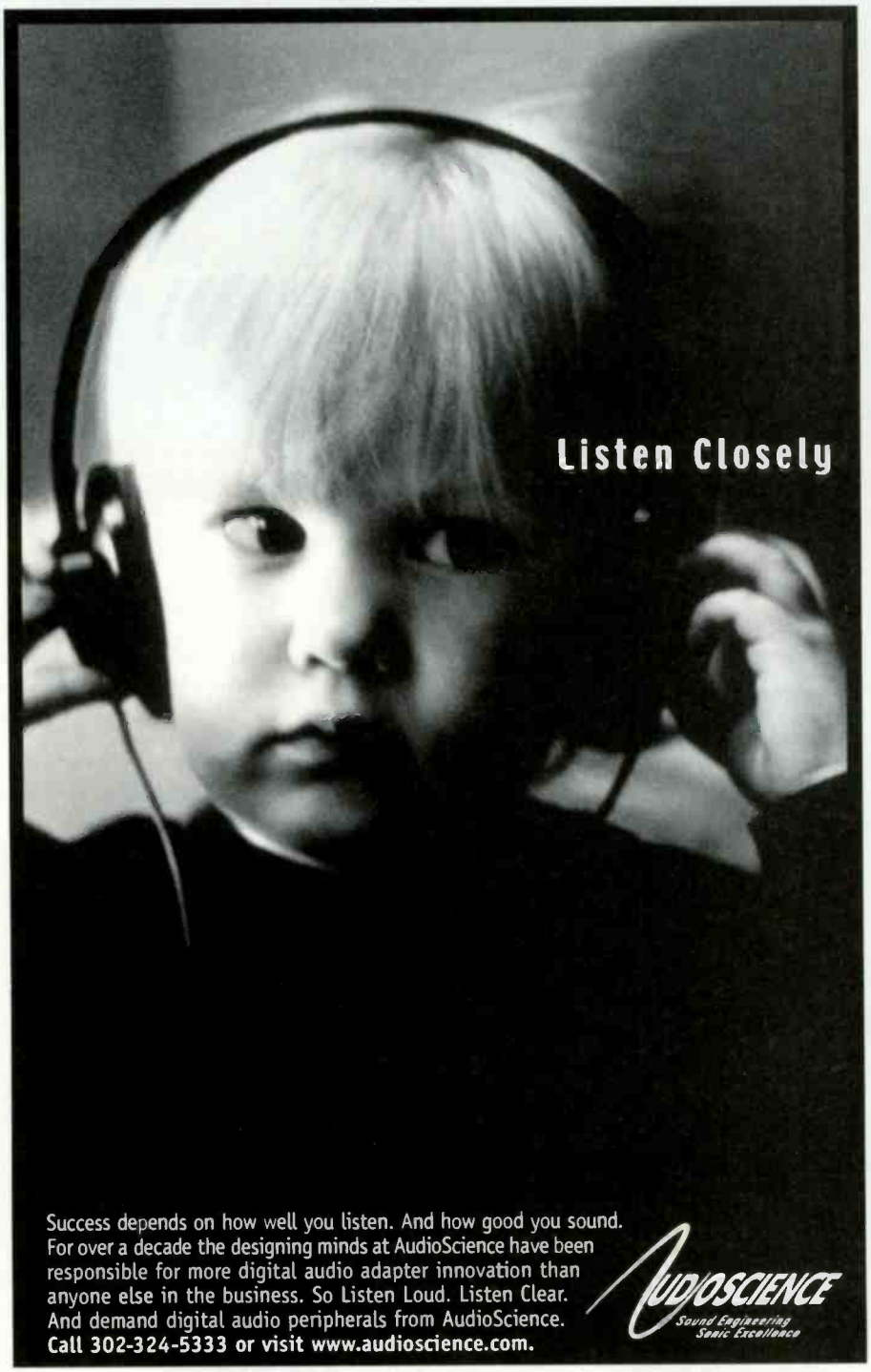

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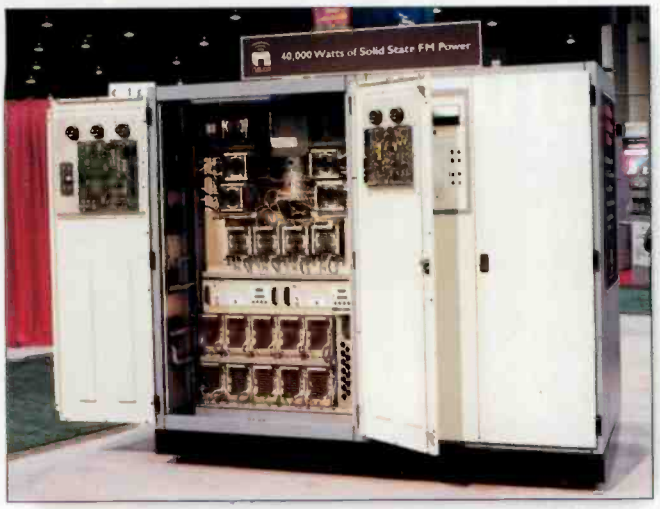
priced 25kW AM transmitter. For FM, OMB offers the EM 30DDS digital FM exciter, controlled by a front-panel keyboard and LCD display.



High-powered solid-state transmitters drew considerable interest from attendees.

Harris presented the new DX Destiny 50kW AM transmitter, which provides a new way to maintain highest operating efficiency. By continuously self-monitoring each serial modulation encoder and PA unit, it is almost possible to have a self-repairing transmitter. The modulator and PA modules can be changed while the transmitter is on the air; it has complete redundancy.

Coaxial Dynamics announced several minor improvements to their existing product line.

ERI showed a new bandpass filter, type 960-4, with nonadjacent coupling intended for use in tight-adjacent conditions. Also shown was the Ward-735 Guardian, a rackmounted, fully integrated antenna system monitor. It can monitor a minimum of eight antenna system conditions, from coax line gas pressure to antenna operating parameters, and displays them on a touchscreen.

Kintronics Labs demonstrated the combined Optilink Fiber Optic Intelligent Control system and DAC-Mod 2-12 software programmable controller.

Central Tower offers a new version of the Wincharger Tower. The stealth model is designed to blend in with it surroundings and make it easier to overcome local resident and zoning objections.

Antenna Concepts presented the latest in two adjacent-channel antennas. This travelling wave antenna is based on time domain theory and is designed to avoid multipath in the field. It has sufficient bandwidth to handle two immediately adjacent channels.

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John Battison is technical editor, RF, of BE Radio *magazine.*

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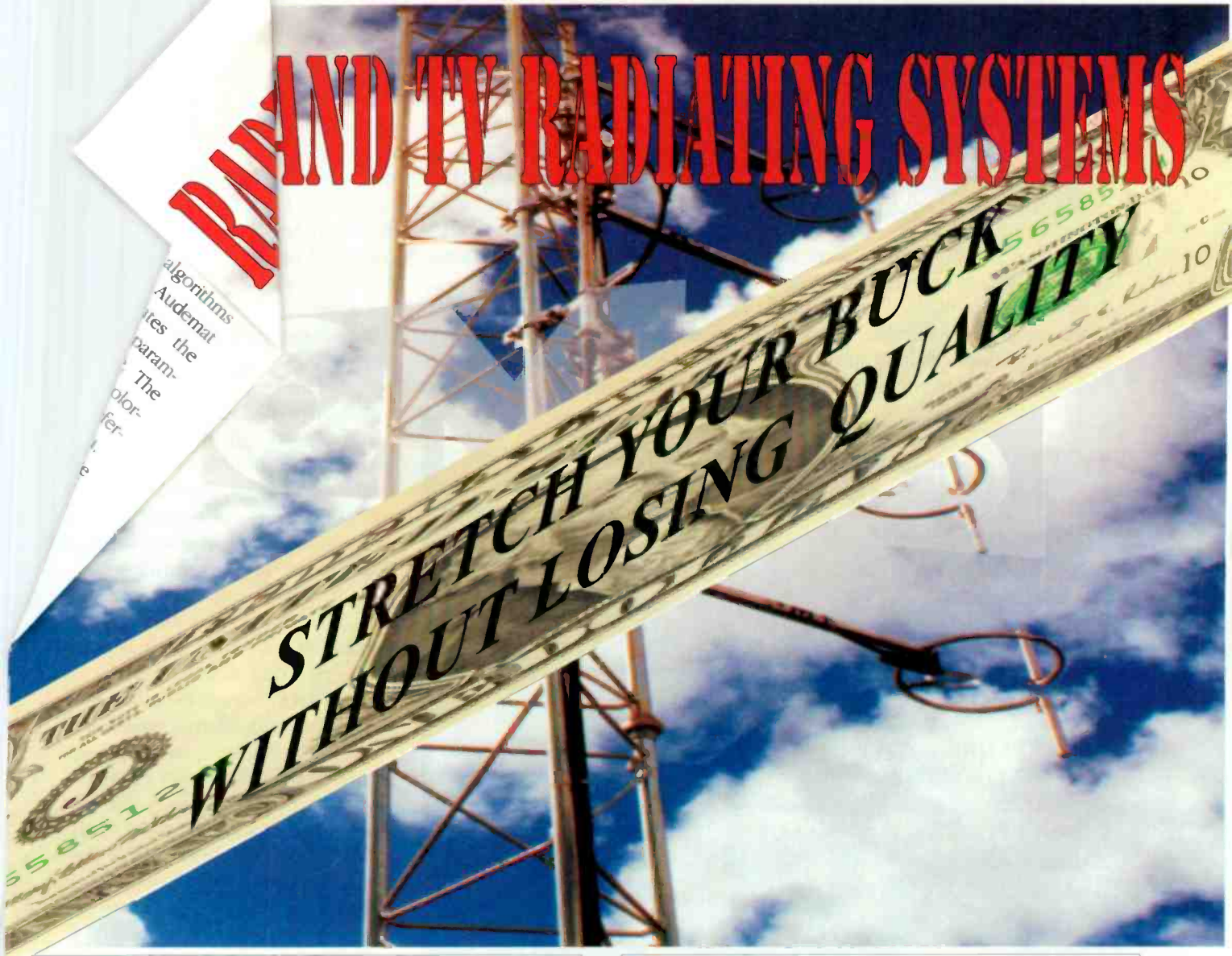

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Test & measurement

By Doug Irwin

Test equipment manufacturers and users alike are benefiting from new types of components (especially DSP) that now allow familiar test functions to be incorporated into smaller devices, many of which can be carried on your belt along with your pager and cell phone. Many of these same devices also perform tests that used to require equipment which was out of reach of many radio station engineering departments.

Audemat introduced new software that works in conjunction with its MC-3 portable measuring receiver (see Pick Hits, page
called GoldenEar, is
objective analysis of
reception. As the use
the coverage area of
under test, GoldenEar
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derived by a body of what
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eters on a scale of one to fiv
output of the program is a set of
coded maps that can be cross-r
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Aztec Radiomedia, part of th
Digigram Group, introduced the AZ100 FM Navigator, a portable VHF measuring receiver. This receiver has a built-in GPS receiver and allows the user to make mobile field-strength measurements without the use of a portable PC, since the measurement data is recorded on a flash card.

Inovonics introduced the model 520, an off-air AM modulation monitor. This is a 1RU, self-contained, medium-wave receiver with a front-panel bar-graph modulation percentage display. The unit is tuned via internal dip switches (530kHz to 1710kHz in 1kHz increments). The user selects one of two RF inputs.

Ward-Beck Systems showed its audio generator/analyzer pair. The ABS-1 Audio Bit Spitter generates an AES or analog audio signal (1kHz or 400Hz selectable). The unit requires four AA batteries and can be clipped on your belt. The ABB-1 Audio Bit Buddy is also a belt-clip, battery-operated unit with digital and analog inputs. The companion unit to the ABS-1, it displays parameters of the signals received.

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Doug Irwin is chief engineer of KKSF, KYLD and KIOI Radio in San Francisco.

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By Barry Thomas, CSRE

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world of computers and the World Wide Web. The proliferation of combined remote facilities has presented the need for centralized, intelligent monitoring and control of transmission systems.

Forecast Consoles displayed its intriguing line of edit suite and workstation furniture systems, including the reasonably priced NL-1 and PC-1 media workstation systems.

Mager Systems showed examples of its furniture line that feature the Wilsonart Gibraltar solid surface.

Gentner unveiled the VRC2500, which replaces the VRC2000 voice remote-control system. The VRC2500 is still a stand-alone facility control unit that can be operated by dial-up telephone but can make automated and scheduled changes without a computer attached. Gentner also introduced its Lynx software, designed to offer improved functionality and flexibility for the company's GSC3000 centralized remote facilities control and monitoring system.

Electronic Associates introduced the DataWorks transmitter remote-control system that can operate as a stand-alone or dedicated-line controller, which includes standard voice, data and SkyTel text pager connectivity.

Equi=Tech showed its Balanced Power Panel System (see Pick Hits, page 60). This larger version of the popular rackmount systems can condition an entire studio.

RDA Systems offers system intregration services and operates **SystemsStore.com**, an online equipment-purchasing site. The SurgeX line of power conditioning equipment was displayed at the show.

Harris introduced IBOC-ready enhancements to the **Intraplex** STL-Plus system and IntraGuide, a remote management system that allows several STL-Plus systems to be connected and managed from one location.

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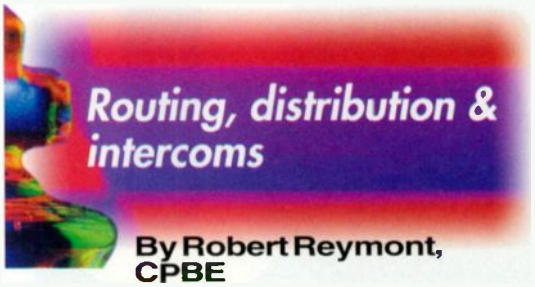
Barry Thomas is director of engineering for Comedy World, Los Angeles.



By Robert Reymont, CPBE

With the advancement of digital systems and connectivity between studios, remotes, audio processing and transmitters, routing and distribution are keeping pace. Today's consolidated radio station environment requires increased routing and control capabilities.

The latest from **Sierra Automated Systems** is the new 32KD digital audio routing switcher. The 32KD offers more crosspoints in less space for less money. This system performs switching, mixing, DSP, IFB and mix-minus functions using the SAS DTDM bus architecture. Fiber optic interfaces allow multiple mainframes to be linked for almost unlimited expansion capabilities. The system handles non-audio such as serial data and provides contact closures through a general-purpose interface.

Klotz Digital showed the Vadis 880 platform with added fiber optic distribution and format conversion, including a range of DSP functions and machine control. The entire line of Klotz products is built on a router concept with control surfaces that handle audio level and mixing functions.

Antex introduced Media Client, a high-performance digital appliance for the Internet. This box serves as an intelligent subscriber terminal with full processing, communications and storage capabilities of a fully configured PC. It is designed to run under Windows CE or LINUX.

Wheatstone introduced the ATC-1 analog and digital routing switcher. The switcher can handle up to 256 digital inputs by 256 digital outputs. Sample-rate conversion, 24-bit A/D and complete integration of control into the Wheatstone D-700, D-600 and Audiotronics NuStar allow for flexibility within the facility. The X-Point control and configuration software allows for integration into automation systems and setup of the router via PC.

Computer Concepts introduced EpiCenter, designed to eliminate conventional audio routers, mixers, compression/limiting equipment, telephone hybrids and control mechanics. A station's audio sources, analog and digital, can be routed, processed, EQ'ed and rerouted in real time anywhere, in any format, digital or analog.

Radio Systems had additions to its Studio Hub wiring system. The line has been expanded to include additional digital and analog devices, including converters, and audio mixing and monitor modules. Studio Hub+ is designed around the CAT-5 wiring standards already in place in most facilities but uses the pairs differently for increased compatibility with Ethernet local area networks.

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

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By Robert A. Van Buhler, CPBE

The main feature of the product offerings at this year's NAB convention was technology integration. Computers, broadcast devices, telecommunications and satellite products are merging. Standards across various industries are coming together as well.

Comrex introduced the Matrix codec (see Pick Hits, page 60), which has plug-in modules for use with ISDN, dial-up (POTS) lines, GSM and next-generation (3G) cellular phones. Accessory modules are interchangeable in the field.

AETA Audio demonstrated the Scoop Reporter II. It is capable of 15kHz program backhaul and concurrent 7.5kHz return audio using the Inmarsat S-band telephones. Various algorithms for changing configurations and upgrades are available for downloading into the product via its serial port.

Armstrong Transmitter offered a digital path with the DTX-4/DRX-4 four-channel encoder-decoder package. It provides four 15kHz audio paths and two 8kHz data and telemetry paths, allowing two stations to share the same STL frequency and also pass paging or RBDS data. The DTX-4/DRX-4 uses 4:1 data compression.

Gentner Communications introduced a new digital hybrid, the DH-30, featuring a 24-bit DSP, three-band equalization and variable bass boost, and caller override characteristics.

Telos Systems showed the Telos Two ISDN Hybrid, which can be used for analog POTS and digital phone lines (BRI/U or S) to use the ISDN network to cross-connect with POTS lines, eliminating the studio side of Telco A/D and D/A. It contains two digital hybrids in one unit. The 2×12 is a self-contained 12-line on-air telephone system with two all-digital hybrids. The system accepts analog or digital (ISDN BRI) telephone lines. Also on display was the 2101, which can interface directly with a T1 line to provide 24 lines of phone service. Also located in the Telos booth, **Software Authority** showed the Zephyr Remote software (see Pick Hits, page 60).

Harris focused on nontraditional program audio paths. Harris' integration of complementary product lines now enables them to deliver audio via LAN and WAN with dedicated bandwidth. The Intraplex Intralink-IP can deliver audio at sampling rates of 128kb/s or 256kb/s, up to a full 2Mb/s in real time.

Trango Systems was represented in the **Diversified Marketing** booth. The Falcon Plus and Eagle Plus systems are unlicensed, FCC Rules part 15 microwave links (see Pick Hits, page 60).

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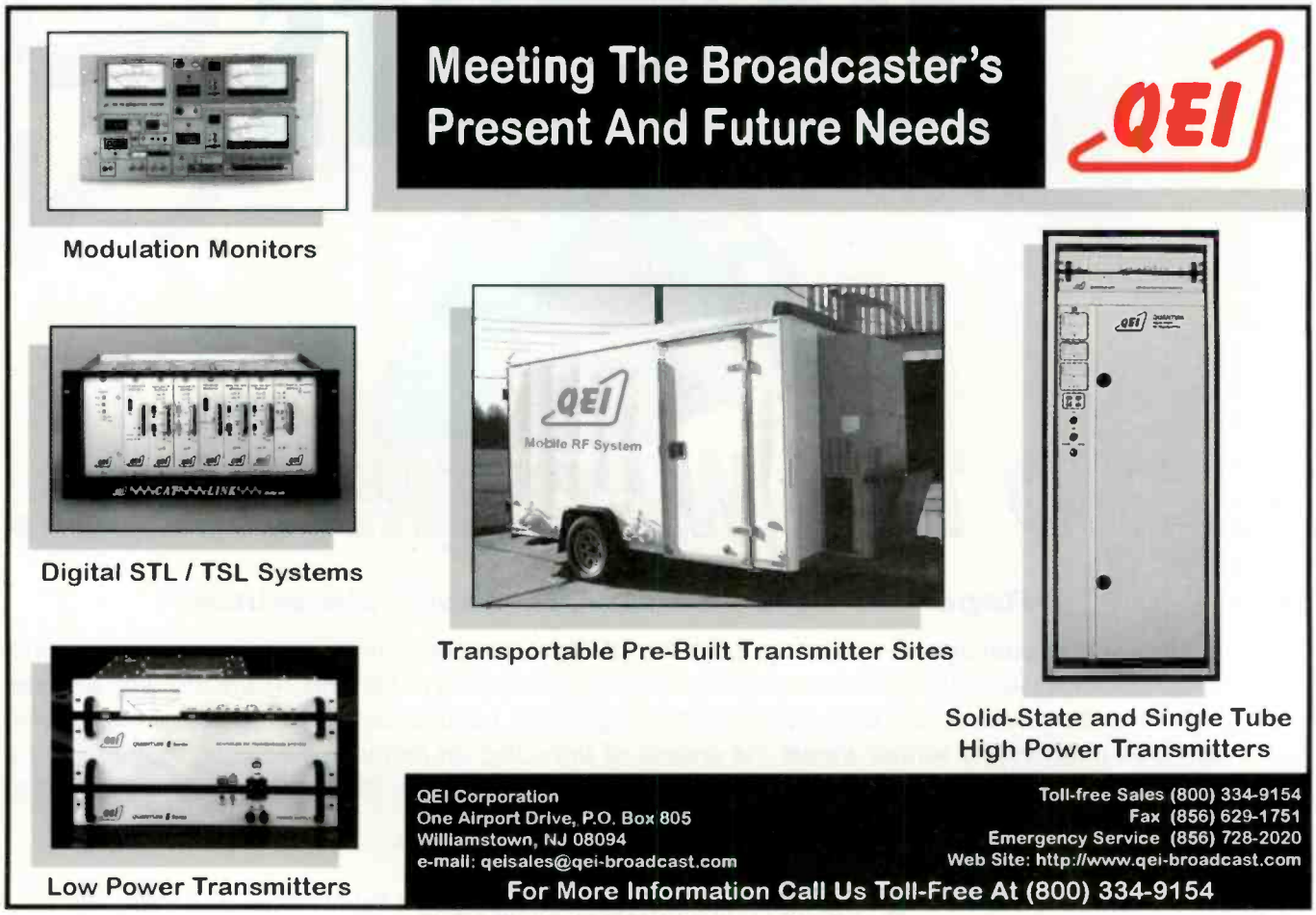
Robert Van Buhler is based in Phoenix.



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BE Radio

NAB 2000 PICK HITS

AND THE WINNERS ARE...

Reported by Dana Martin, associate editor

It's that time of year again — time to publish the 10 Pick Hit winners that were selected at NAB2000. As in previous years, the panel comprises professionals working in the field. All are industry experts. All made their selections independent of the magazine's editorial staff. The quality of the judging ensures each trophy winner meets the criteria of providing an innovative solution that address a significant issue in radio technology. Hats off to these grandmasters. Though the match is over, these products will remain standing for some time.

For complete rules governing the Pick Hits selection process as well as a list of judges, see pages 63-64.

Unlicensed RF link

Trango Systems

▼**Falcon Plus/Eagle Plus:** The former is a 5.8GHz system that features 12 user channels, up to 7 miles line of sight, operation on

12vdc, two audio channels, one video channel and one data channel. The latter is a 2.4GHz system that features four user channels, up to 4 miles line of sight, operation on 12vdc, two audio channels, one video channel and one data channel.

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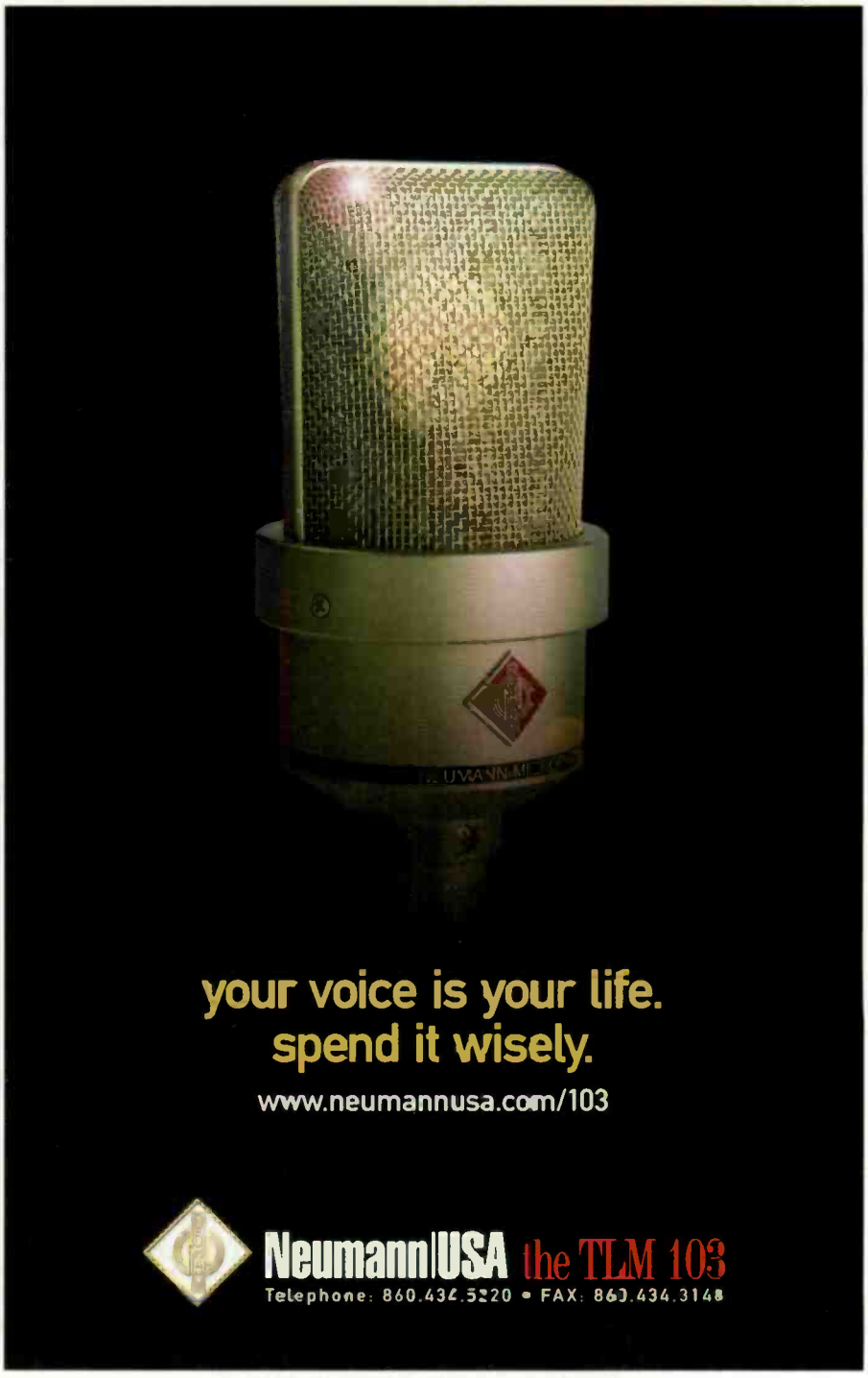

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NAB 2000 PICK HITS

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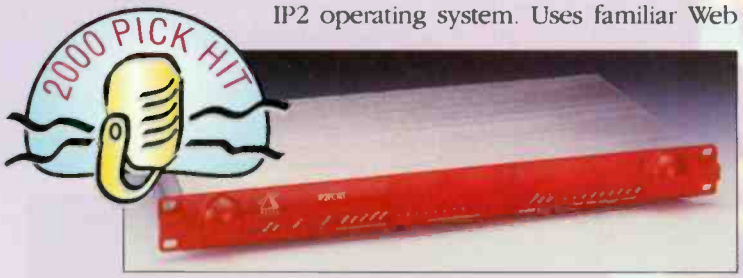
IP2com, IP2port: The IP2port allows for remote equipment management from any location via TCP/IP. Includes a comprehensive set of serial and logic interfaces and the powerful IP2 operating system. Uses familiar Web



tools to manage and control devices remotely from any network connection. Ideal for remote management of radio transmission sites. The IP2com gateway link enables supervision, remote control, remote maintenance, remote operations and other functions.

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FM, AM, Net processor
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Omnia-3: Each processor in the Omnia-3 family includes 48kHz sampling, multiband processing, digital audio inputs and outputs, an integrated composite clipper, and a removable PC card that simplifies software changes. The FM processor includes three-band processing as well as an integrated composite clipper, an all-digital stereo generator and daypart automation, all standard. The AM processor includes four-band processing, NRSC low-pass filtering, selectable narrow-band filters for news/talk formats and international requirements — even an EQ adjustment specifically for plate-modulated transmitters. The Net processor includes a host of processing presets designed to ensure spectral balance at common bit rates, a PC-Card slot to store, share and recall your custom processing algorithms and an RS-232 port.

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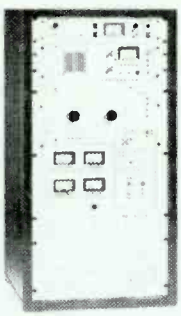

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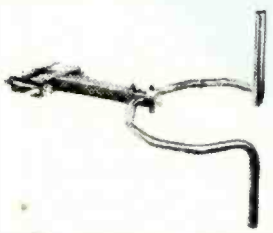

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BE Radio Pick Hits Rules

1. Products must be new and must not have been shown at a previous spring NAB convention. In some cases, distinguishing a new product from a modified one is difficult. For Pick Hits purposes, a new product is one with a new model number or designation.

2. Products must have some positive effect on the intended user's everyday work. Judges search for equipment to be used on a regular basis. Products should provide new solutions to common problems.

3. Products must offer substantial improvements over previous technologies. Unique circuit architecture need not be included, but some new approach or application must be involved in the product's design.

4. The price of the products must be within reach of their intended users. The judges seek products appropriate to a range of facilities.

5. The products must be available for purchase within calendar year 2000. Equipment must be on display on the show floor, currently (or imminently) in production, and some type of product literature must be available. Judges take the exhibitor's word on availability dates. Products demonstrated in private showings do not qualify.

6. The editorial staff of *BE Radio* serves only to moderate the final selection process. It has no vote or influence in determining the winners.

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NAB 2000 PICK HITS

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Pick Hits Judges

Stephanie Snyder, CBT
Senior Engineer
Yahoo! Broadcast
Dallas, TX

Joel Nelson
Staff Engineer
D.L. Markley and Associates
Peoria, IL

David Stewart
Director of Engineering
Hispanic Broadcasting
Dallas, TX

Andy Laird, CPBE
Director of Engineering, Radio Group
Journal Broadcast Group
Milwaukee, WI

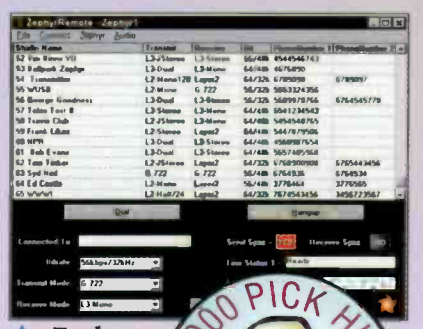
Kirk Harnack
President
Harnack Engineering
Cleveland, MS

Mike Starling, CPBE
Vice President of Engineering
NPR
Washington, D.C.

Richard Rudman, CPBE
Director of Engineering
KFWB Radio
Hollywood, CA

Remote control software

Software Authority



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The virtual public file

Did you know that at least a portion of your public file may have to be posted on the Internet within the next year?

By William Fawcett

Recent changes in the public inspection file rules allowed for the following: "All or part of the file may be maintained in a computer database, as long as a computer terminal is made available, at the location of the file, to members of the public who wish to review the file." This rule did not require use of the World Wide Web but allowed for the use of computerized documentation systems, including HTML-based intranet technology. In many ways, this decision makes sense.

In a classic camel's-nose-under-the-tent scenario, the FCC made a leap from permitting the use of Web technology for maintaining the public file to requiring the use of the Web for certain EEO files.

In the Report and Order released in January, 2000, the FCC states, "We also require that, if a broadcaster has a web site for its station, it post that station's EEO public file report on that site at the same time that it places it in the station's public file." Indeed, the actual rule in Section 73.2080(c)(6) states that this EEO report is to be placed "on its web site, if it has one." It appears that stations that must meet the new EEO guidelines (in general, those with five or more full-time employees) will be entering the brave new world of the virtual public file.

Windows to the Web

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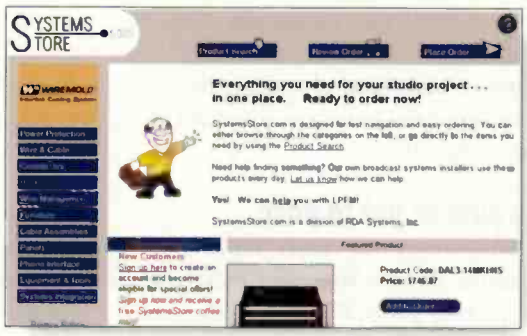

www.systemstore.com

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

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OMT Technologies: MediaTouch by OMT Technologies provides radio stations with state of the art digital audio systems for live assist or full automation use. With over 14 years of broadcast experience, MediaTouch has innovative software solutions starting as low as $995. Surf to MediaTouch, see our exciting new products and find out how our clients sound better and save money with our unsurpassed quality, reliability and support.

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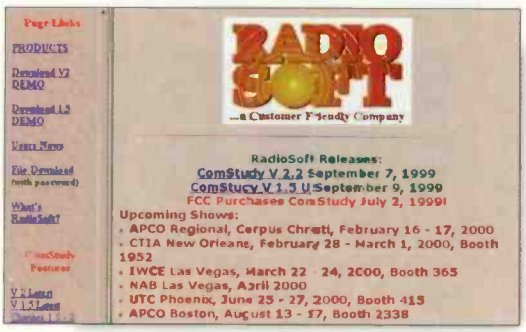

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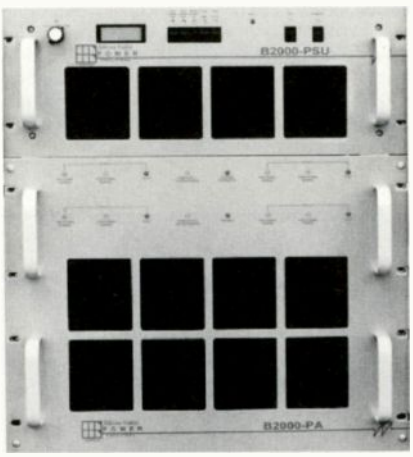

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The virtual public file

Main studio rule

Changes in the main-studio rule helped bring this on. Pleadings for the relaxation of the main-studio rule cited the fact that an Internet-based public file could eliminate the need for a physical file in the community of license. In the August 11, 1998, Report and Order, the commission stated: "Although we encourage stations to maintain files electronically...we will not require them to do so given the burdens this could impose on members of the public without computer access or ability, and on stations, given current technology and stations' current computer capabilities." So, here we are less than two years later with a requirement for public-file information on the Web. As you will learn, when it comes to EEO, no requirement is unreasonable.

Broadcasters with a main-studio waiver that maintain a public file outside of the city of license will still have to fulfill telephone requests for certain public-file information to those within the station's geographic service area. It is possible that having the same files available via the Web could reduce the volume of such requests. For all stations, regardless of the location of the main studio, a Web-based file can be a great aid in the organization of the public file.

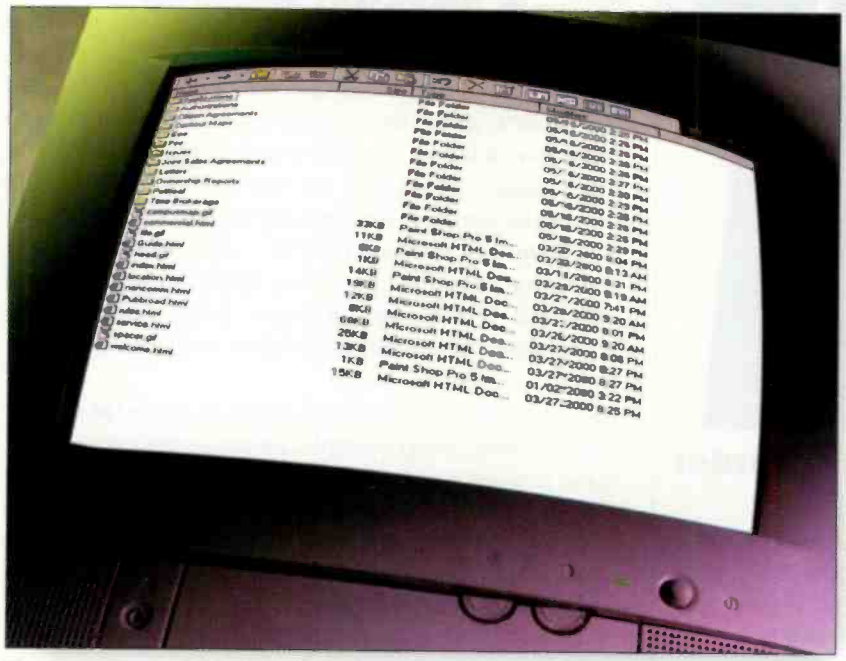
To post or not to post

Aside from the EEO report, which must be made available on the Web, one must consider the advisability of making public-file information readily available to the general public. Worse yet, it must be available to your competition and adversaries. Let's face it — most public files have seldom, if ever, been visited. Place the same information on the Web, and there is no telling where the data could end up.

For instance, the fictitious group Parents for Teddy-Bear Safety might review the issues list of 100 stations and determine that your station is deficient in promoting bear-safety awareness. Could this lead to a challenge at renewal time?

Certain time-brokerage and sales agreements and, for non-coms, donor lists, comprise a part of the public file. Competing stations typically do not raid each other's public files because reciprocal raids would result. Place the information on the Web and your competition surely will browse.

I'm not sure that the public appreciates that their letters and e-mails become part of the commercial station's public file. Consider the reaction of a citizen who writes a crusty letter (when having a bad day) only to find it, along with identifying personal information, available to all on the Web. Because of their content, some letters are not required to be made public; in all cases, writers may request that their letters not be made public. Still, the thought of posting letters on the Internet should make attorneys quiver, either with horror or anticipation.



The individual required elements can be organized into file folders. The opening webpage will provide links to the individual directories and their contents.

These are serious issues. Stations must consider each line item in the public file rules (Section 73.3526 and 73.3527) and how much they will reveal.

A hybrid model

Placing the public-file template on the Internet would make it clear which files are available. Using HTML, link to sensitive files with a *file:\\c:\filename.doc* label instead of an Internet URL. Such files will not show up on the Internet. These files could be placed on an intranet server or local machine at the station. The viewer would then have to visit the station to view those files (or call in an order, if the station has a main-studio waiver). Instead of parking a visitor at a file cabinet, you make a dedicated (read-only) terminal available. With a nearby printer and a CGI script to collect credit-card information for printing charges, you could make the operation practically self-service. Ironically, this same technology also lets you record what the visitor views.

Web organization

Public files have a way of collecting entirely too much information, and it is a headache to constantly inventory the file to make sure everything is there. Paper files have a way of being misplaced or disappearing altogether. The virtual public file gives you a tool

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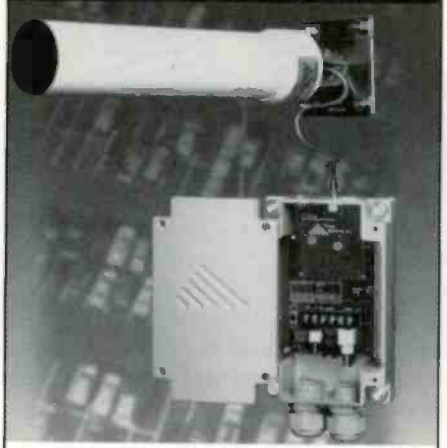

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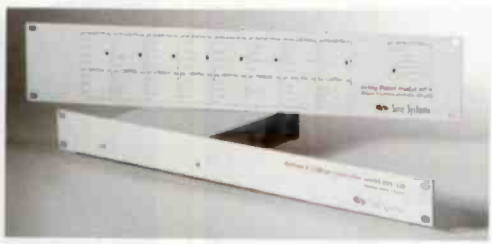

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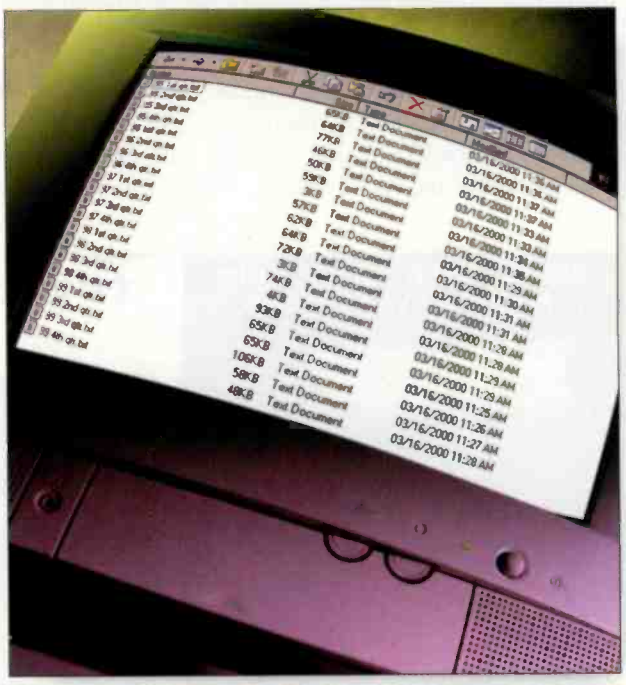
The virtual public file

to maintain c mplete, orderly files.

A simple way to order your virtual public file is to use the 12 subject headings that apply to radio contained in 73.3526(e) as your 12 folders. An index page consisting of the text from the rules could have links from the headings of each of these subjects. The entire text makes it easy for you to determine what goes there as you work on your files. Instead of creating individual HTML pages for each folder, simply place appropriate files within each folder, using very descriptive file names.

For instance, your issues list would be placed in a folder named *Issues*. Keep it simple. Prepare your issues report using a word processor as you probably do now. You would have file names like *2000 1-Quarter.doc* and *1999 4-Quarter.doc*. It should be clear to all what these files are. In the absence of a page such as *index.html* in a directory, your browser should return an Explorer-like listing of all files in that folder. File formats can be



The programs and Issues list files should have names that clearly indicate the time period they cover.

anything your browser can read including doc, html, pdf, txt and many others.

This system gives you a quick, dynamic method of organization. It updates every time you add a file. You can see at a glance what is there, and what is missing. A sample virtual public file has been placed on the *BE Radio* website. Go to www.beradio.com, and click on the image of the June cover. You can use it as a template for your own use, and you can modify it in however you please.

Larger organizations

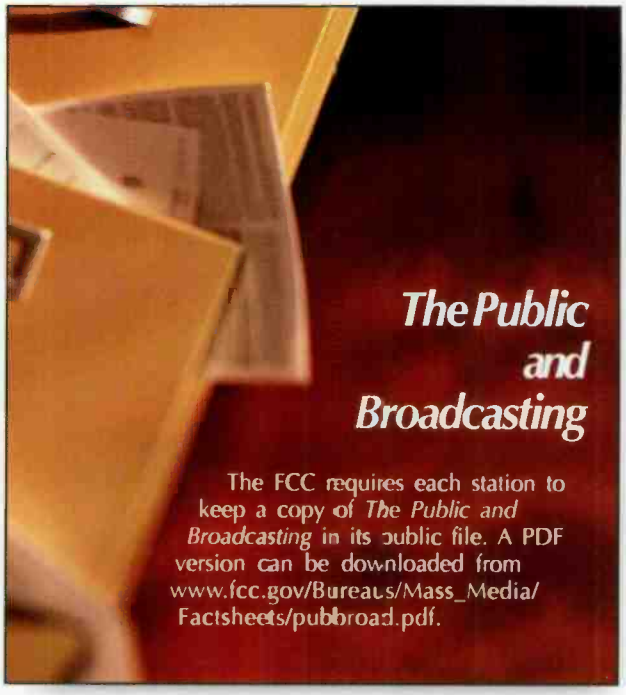
The law requires that a separate public file be maintained for each station. This results in a filing

nightmare for large duopolies or regional public radio networks. Using Web technology, you can index each station separately but share common files, such as issues or ownership, when they are common. Larger groups can make the files available for review at corporate headquarters through restricted servers or CD-ROMs.

Training station personnel in public-file procedures has long been a headache. By implementing a virtual public file on the station intranet, you make the information available in a manner that almost all employees understand. And casual browsing by station employees, on a well-designed website, will only increase their knowledge.

If not now, then when?

Clearly, the issue is not whether you will place public-file information on the Web; it is what information will you place there. Once you get started, it is very easy to use the process as an organizational tool that will help refine and maintain your public file. Documents such as the quarterly issues list can be added to the file in an electronic format as they become available. Scanning time is a major obstacle for historical documents, such as station authorizations. However, this initial start-up time should pay for itself in the form of increased productivity once the file has been established.



Take the leap. It is perhaps simply a matter of months before an electronic public file is a requirement anyway.

William Fawcett is director of engineering at the Center for Public Broadcasting at James Madison University and president of Mountain Valley Broadcast Service in Harrisonburg, VA.

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X4P Network: Based on a PCI PC-board, this unit provides the use of a secure, private network via the Internet to distribute audio signals and graphics or video images. Gives any XP4 Network subscriber access to media data stored on servers in an SPN. Audio and multimedia contents are coded with MPEG-4/AAC algorithms and stored on servers. The contents are ready for download by users who have been authorized by the producer. For secure transmission through the Internet, the unit scrambles the signal, enabling prelistening at lower quality levels.

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▶ **ASI4336:** Features multistream MPEG audio record/playback, GPIO and an RS-422 serial input. The GPIO comprises eight relay outputs and 16 opto-isolated inputs. These enable the control of station equipment and sensing of news feeds and other events. Through the use of the WaveX extensions to its Windows multimedia drivers, the GPIO may be accessed using standard Windows mixer calls. The unit's RS-422 serial input supports the direct input of a satellite receiver MPEG bitstream, which can be recorded as a standard WAVE or BWF file for later playback. Removes the MPEG transcode and A/D conversion process that typically occurs when recording network satellite feeds.

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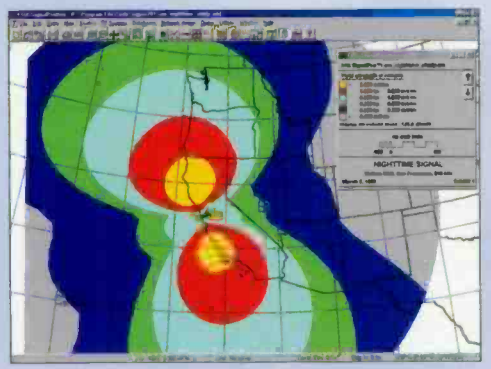

Frequency allocation studies
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◀ **AMW 4.0:** This Windows 95/98/NT application provides complete daytime groundwave and nighttime skywave frequency allocation studies. Calculates allowable radiation to avoid contour overlap to other stations. Nighttime studies provide full radiation limit calculations to co-channel and adjacent stations. Available as an add-on module to Signal and EDX SignalPro or as a standalone application. Users have unlimited access to the FCC's AM database, free of charge.

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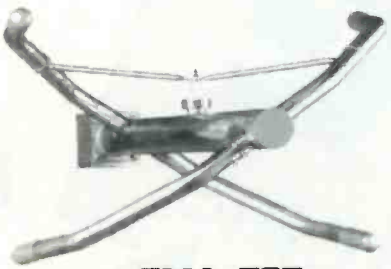

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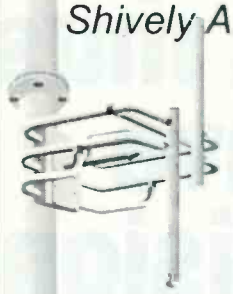

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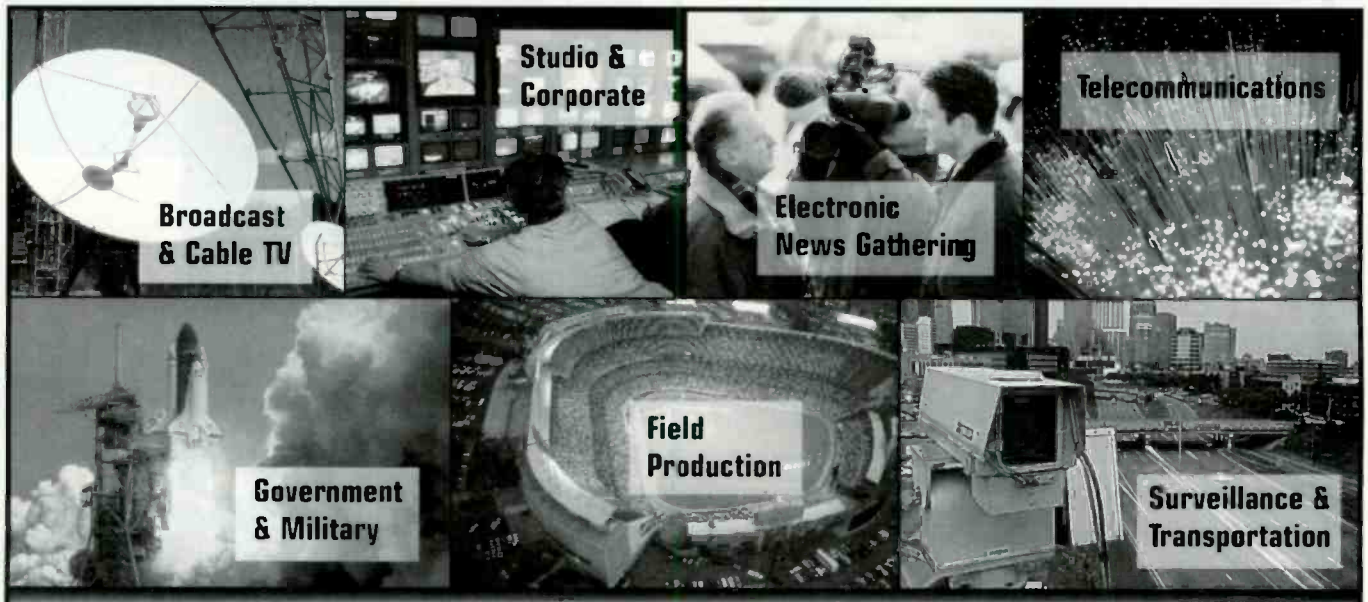

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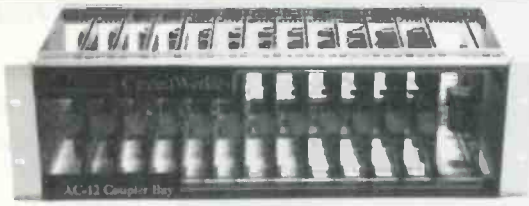

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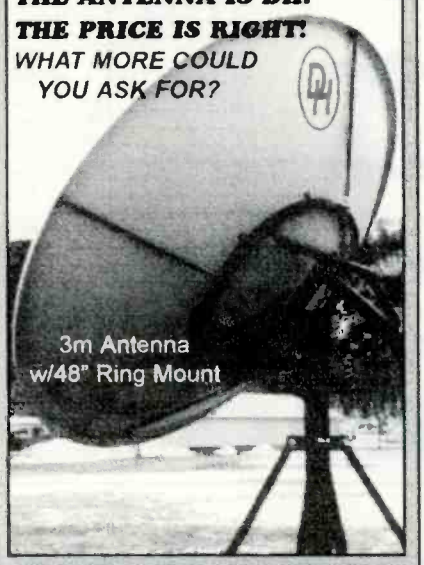

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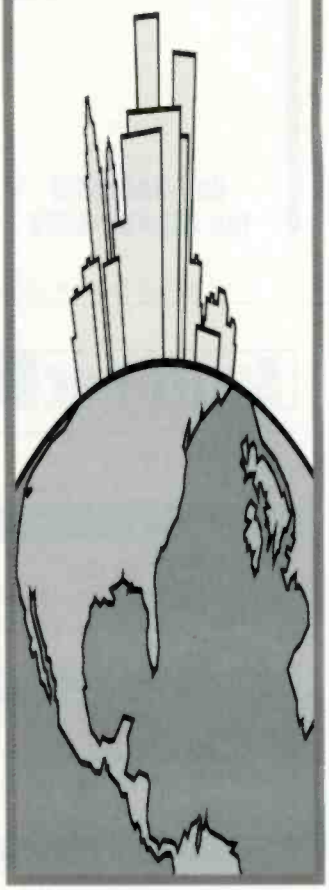

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Over the line

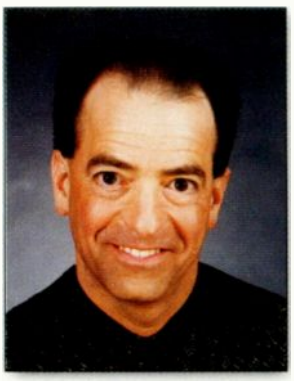
By Skip Pizzi, executive editor

Frequent readers will recognize the phrase "boom box with a browser" as a term often used on this page to describe a future device that converges traditional radio with Internet radio on a single, dedicated receiver.

As Internet time would have it, such a device has already moved from concept to reality. Several companies have introduced their variants of the concept, and the devices will begin to proliferate into the marketplace over the next few months. Let's take a look at one interesting example.

Can you Kerbango?

Kerbango, a company comprising ex-Apple and ex-Power Computing folks, will soon release its first product. The device is an "Internet audio appliance" that the company will at first make itself. It hopes to eventually license the technology to consumer electronic manufacturers. It will also operate an Internet portal accessible to PCs via standard browsers or to the company's appliance (already up at www.kerbango.com), which will feature a large volume of audio content and links to other audio sites.



In its first generation, the appliance will have a tabletop form factor, designed for ac use only, and it will include AM and FM tuner sections along with a wired analog modem for dial-up Internet access. The company plans to incorporate other features later, including broadband and/or wireless Internet access, MP3 decoding and a hard drive for storage of audio files. Other form factors will include portable and automotive versions.

The Kerbango portal includes a search engine optimized for seeking audio services and titles. It also allows users to set contextual, personal profiles of their audio tastes and preferences. The company claims it will use human editors to check all links at the site twice an hour to verify that they are still functional. Using automation software, this function will alert users to any broken or busy links, and will keep checking a problem link, taking statistics until the issue has cleared, at which point users will be alerted of the link's renewed availability. The portal will also maintain a schedule of audio webcast events.

The Kerbango portal includes a search engine optimized for seeking audio services and titles.

Breaking some ground

A unique feature of the system involves a presentation of audio quality expectations for each service. The PC browser or Internet appliance will display a "signal strength" meter, using the visual metaphor from an FM tuner. This display will be based on a number of parameters, including encoded quality of the source and Internet traffic at the time. (The company's website has more detail on the formula for determining "signal strength.")

The Kerbango appliance controls incorporate the common "grammar" of audio/radio devices and Internet browsers, but with an emphasis on the former. For example, there are station preset buttons, a tape-deck style transport button set and a volume knob, but where the radio control metaphor is inadequate, browser functions are used (such as a "back" button). There is also a dedicated information button for more data about the current audio selection, and a combination-lock security model for making purchases. A set of soft keys under the appliance's small LCD screen is used for many other envisioned features, such as voting for next song, "tell-me-more" advertising and sending requests for information via e-mail.

The business model for the company involves no subscriptions or Internet access services. Users will simply buy a Kerbango appliance, or use a PC browser, and access the Kerbango "tuning server" via their own ISPs. In this respect, Kerbango appears to use the portal revenue model (i.e., selling advertising and traffic driven to linked sites) and adapt it for audio. The company will not create or host any audio services itself. Other "audio portals" have done this, of course, and there will no doubt be many more to come, but Kerbango's unique added value is the attempt to put Internet audio and regular radio on new, common ground. It does this by creating a common hardware receiver and attempting to add a measure of reliability to Internet audio services — a problem users often site.

Whether this new venture is a good or a bad thing depends upon your point of view. Whether Kerbango will succeed is also unknown. Nevertheless, this development, and others like it, represent the crossing of a line that the industry should note well. It may represent the future receiver platform, and the real meaning of digital radio.

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